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Los Angeles, Calif.

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MEETINGS OF PHYSICAL THERAPY ORGANIZATIONS

In these columns will be published information about meetings, election of officers, etc., of physical therapy organizations. New data should be sent promptly to the office of the Secretary, 2 E. 88th St., New York.

New Jersey Society of Physical Therapy Physicians; meetings to be held monthly during the winter season in various centers in the State. Dr. Robert F. Dow, 592 East 29th Street, Paterson, N. J., Secretary.

Physical Therapy Section of the New York State Medical Society, Hotel Statler, Buffalo, N. Y., Tuesday, May 4, 1943. Chairman, Dr. Joseph A. E. Syracuse, Columbus Hospital, Buffalo, N. Y.; Secretary, Dr. Kristian G. Hansson, 33 East 61st Street, New York, N. Y. (See announcement elsewhere this issue.)

New York Physical Therapy Society; meetings on first Wednesdays, from October to May, New York City; Dr. Madge C. L. McGuinness, 1211 Madison Avenue, New York, Secretary.

Connecticut Physical Therapy Society, meetings held in May and October at same time as the Connecticut State Medical Society. Dr. Karl Bretzfelder, 315 Whitney Avenue, New Haven, Conn., Secretary-Treasurer.

Kings County Medical Society, Physical Therapy Section; meetings at 1313 Bedford Avenue, Brooklyn, bi-monthly on second Thursdays; Dr. Samuel A. Warshaw, 1373 Ocean Parkway, Brooklyn, N. Y., Secretary.

New England Physical Therapy Society; meetings at Hotel Kenmore, Boston on third Wednesdays from October to June; Dr. William McFee, 41 Bay State Road, Boston, Mass., Secretary.

The Penna. Academy of Physical Medicine; meetings at the Phila. County Medical Building, 21st and Spruce Streets, third Thursday, alternate months, starting with January; Dr. Harold Lefkoe, 5217 North Broadway, Philadelphia, Secretary-Treasurer.

PHYSICAL THERAPY IN WAR *

A Primer on Indications and Technic

RICHARD KOVÁCS, M.D.

NEW YORK, N.Y.

Front line medical service in war aims to restore men within the shortest possible time for duty in the firing line, while the reconstruction or rehabilitation medical service behind the front or at home bases is directed toward anatomic and functional reconstruction of those definitely disabled. The value of physical therapy in helping to restore function and to relieve pain was fully recognized at the time of World War I. As a result, in World War II physical therapy personnel and equipment are being made available in all base and reconstruction hospitals as well as in advanced hospitals on the front. These physical treatment measures, of course, have to be always applied in conjunction with or subsequent to all indicated surgical and general medical care.

The principal injuries and disabilities connected with warfare and amenable to physical therapy are as follows:

1. Injuries and affections of the locomotor system: strains, sprains, dislocations, traumatic arthritis, stiff joints, fractures, amputations, chronic osteomyelitis, myositis, ischemic contracture, tenosynovitis, bursitis, back injuries, painful feet.
2. Affections of the nervous system: peripheral nerve injuries, traumatic neuroses and mental conditions.
3. Injuries of the skin and adjacent parts: contusions, burns, cold injuries, wounds and ulcers, scars.

Injuries of the Locomotor System

General Considerations. — In all physical injuries according to the type and extent of trauma there occur extravasation of blood and lymph from torn vessels and capillaries and edema from increased transudation of lymph, and there may be tearing of ligaments, rupture of muscles and tendons or injury to cartilage or bone. The primary treatment for these changes consists of the stopping of hemorrhage, overcoming of shock, prevention of infection, uniting of broken surfaces and provision of physiologic rest for undisturbed healing.

For many years the routine management of recent traumatism consisted of immobilization in order to provide undisturbed healing. The three principles of Thomas for treatment were: rest, test of recovery by tentative use in splints and, finally, natural use. This procedure ignored the fact that for the repair of an injury efficient blood supply is necessary and that rest itself promotes the organization of the extravasated fluid and induces formation of intra- and perimuscular as well as periarticular adhesions. In immobilized extremities there also develops an early atrophy of muscles. The present day tendency in treatment of recent injury is to provide immobilization only as long as necessary for the proper coaptation and adherence of broken surfaces or torn ligaments, for it is now generally recognized that the neglect of soft tissue damage is often the principal cause of delayed recovery and subsequent discomfort.

* The major part of this material is taken from the author's "Electrotherapy and Light Therapy, with the Elements of Mechanotherapy and Hydrotherapy," Philadelphia, Lea and Febiger, 4th ed., 1942.

Lack of full recovery after injuries despite successful surgical treatment and combating of infection is in many cases due to the fact that body forces are not always successful in removing unaided the products of recent traumatism. Passive hyperemia is caused by damage to vessel walls and the irritation of vasomotor nerves; its final result may be structural changes such as permanent enlargement of small vessels, increase of connective tissue and later fibrotic induration. Adhesions are caused by the organization of "coagulable" lymph exuded after the injury and formed during the process of inflammation and repair. In the early stages this granulation tissue holding together the adjoining surfaces of muscles, tendons and fasciae can be easily separated. In the later stages the newly formed blood vessels disappear, the new tissue becomes fibrous and contracts; bands form which irregularly bind together adjacent surfaces, causing limitation of motion and pain by pressure or by stretching of nerve endings. Muscle atrophy may be caused by disuse, by interference with circulation, by disease of adjacent joints or by injury to the nerve supply. In most cases of injury a vicious circle is established, the injury itself causing a diminution of blood supply and inactivity and the subsequent loss of muscle action resulting in further loss of tone and atrophy.

The general scheme of the treatment of recent injuries is as follows: The first requisite is an accurate diagnosis as to the nature and extent of injuries. If the injury does not demand complete immobilization the immediate application of gentle stroking massage by the physician to the periphery of the traumatized area will reflexly speed up the circulation, hasten the dissipation of the edema and relieve pain. A short cold application in the form of an icebag or an iced compress exerts a vasoconstricting and pain-relieving effect and is useful in the immediate treatment of contusions and hematomas. After the checking of edema and swelling an elastic bandage or strapping may be applied; the injured part may be elevated and kept at rest.

With the passing of the acute stage thermal measures should be employed for the improvement of circulation and the relief of pain and as an introduction to suitable mechanical measures. In all subacute and chronic injuries, heat is one of the principal means for speeding up the process of repair and giving comfort to the patient. Its various forms are selected according to the location and extent of the injury. Radiant sources of heating serve conveniently for affecting the skin, subcutaneous tissue and superficial layers of muscles, while diathermy and short wave diathermy serve more efficiently for heating deeper structures, especially joints and bursae.

The hot whirlpool bath offers a combination of heating with mild friction. It is most effective as a circulatory stimulant in contusions, in sprains and fractures immediately after removal of splints or cast, in indolent ulcers, in adherent scars and in peripheral nerve lesions.

Mechanical measures, such as massage, active and passive exercise and electrical stimulation of muscles and tissues, may be employed for combating the immediate effects of trauma: edema, exudation and muscle spasm or its sequelae, adhesions and stiffness. As a rule mechanical measures work best when preceded by suitable heating.

Early application of relaxed passive movement or of exercising electrical currents will act as a preventative of stiffness, fibrosis and muscular atrophy. Later, careful active movements are instituted. Active exercise is the most desirable for reeducating wasted muscles, for increasing the range of joint movement and for promoting muscle coordination. Resistive exercises make possible localization of effects to certain joints and muscles. Passive ex-

ercise is a dangerous procedure and must be reserved for special conditions and expert hands.

Electrical currents of low frequency, such as the surging faradic, serve for stimulating weak muscles without moving the joints on which they act; they also serve in other forms for maintaining some of the functions in fully paralyzed muscles. Electrodiagnosis by the galvanic and faradic current is indispensable for diagnosis and prognosis in nerve lesions or to prove the existence of simulated paralysis.

Electrochemical measures in the form of the galvanic current or chlorine ionization may serve for promoting absorption and for dissolving small scars. Local ultraviolet irradiation is of help in skin infections, in minor burns and for stimulating epithelization.

Strains. — Excessive use — as a rule stretching — of a muscle or a joint without a tear or displacement is known as a strain. In severe muscle strain a subcutaneous wound of more or less severity accompanies the loss of tone and contractility; there are extravasation of lymph and blood and considerable restriction of motion. In the later stages adhesions are formed which are highly sensitive; in addition there may be a protective spasm of the neighboring muscles opposing any attempt to drag on the adhesions. The final result may be fixation and stiffness of a muscle or group of muscles.

Treatment consists of application of mild external heating; this may be followed by gentle massage and careful motion or graduated contraction and relaxation of muscle by the faradic surge. Smart states that the latter treatment causes recovery of muscle tone, promotes absorption of the effusion, directly stimulates free circulation of blood in the injured part and its neighborhood and above all prevents the formation of adhesions around the muscles and tendons.

Myositis. — Acute myositis is characterized by an ache in the affected muscle, which is tender and is held rigid in order to prevent movement. It may follow exposure or strain or it may come about in the course of an infectious condition, such as an attack of rheumatic fever. Acute myositis has certain sites of predilection. Among these are the shoulder, omalgia; the lumbar region, lumbago; the intercostal muscle, pleurodynia; the posterior muscles of the neck, torticollis. Local treatment in acute cases consists of physiologic rest and heat. These may be followed by gentle massage or use of the surging faradic current.

In chronic myositis the pain is duller and is particularly evident when the muscle is put into active use, while passive motion is usually free. Inflammatory deposits form in the muscle, often near its tendon attachment, and are demonstrable by definitely localized tender areas, with a palpable induration. Local treatment is directed to the removal of the inflammatory products through the increase of circulation by luminous heat or diathermy and by mechanical measures: massage by hand, by the static wave current and sparks or by graduated muscular contraction. These measures must be instituted in accordance with the individual reaction of patients. When the painful nodules are definitely located they must be manipulated or stretched and the patient must be informed that this may involve a great deal of discomfort and at times real pain.

At times very prompt and impressive "cures" can be effected by manipulation procedures in freeing fibrous adhesions and moving joints through a range of motion which the patient heretofore has not dared to attempt on account of the apprehension of the pain experienced in the acute stage. As a rule, however, long-continued local as well as general measures are necessary until the patient is definitely relieved; even then he must be warned

to watch out for the slightest evidence of a return of symptoms. In stubborn chronic myositis large doses of galvanism, with the negative pad as the active electrode, have proved useful. In recent years striking results have been achieved by histamine ion transfer.

Ischemic Contracture. — Volkmann's ischemic contracture is a typical flexion contracture of the muscles of the fingers, wrist and forearm, a result of interference with the circulation in muscle cells from tight splinting with subsequent ischemia and ischemic necrosis. Promptly recognized early stages of this condition may be benefited by gentle massage, active exercise in a warm whirlpool bath and gentle traction by suitable devices. But even moderately intense heating may be dangerous both in early and in late stages on account of the existing trophic disturbance and the lack of temperature appreciation by the patient.

Sprains. — A sprain of a joint implies primarily a tearing of ligaments but may also involve injury to the periosteum, muscles, tendons, blood vessels and supporting soft tissues. The typical signs are swelling, pain, increased or abnormal mobility of the joint when there is damage to its ligaments and localized tenderness. Besides the use of external forms of heating the early use of diathermy has proved especially effective for the reduction of swelling and promotion of absorption; graduated muscular contractions by low frequency currents and massage should begin with gentle stroking above the site of the injury, with the whole limb in a position to relax all muscles. This procedure aims to restore vasomotor tone and prevent further swelling. After treatment firm bandaging or strapping is to be applied. At subsequent treatments deep stroking and kneading may be used to dissipate the effusion. Careful and limited passive movements are given to the affected joint, while the joints distal to the injury are freely moved. Treatment should be given daily from ten to thirty minutes and gradually increased, while the support of bandaging or strapping is gradually reduced.

Dislocations. — In a dislocation there occurs a rupture of the joint capsule, usually at its weakest point. In uncomplicated dislocation of any joint which has been reduced physical therapy should start on the day of the accident. If this is done much time will be saved in the restoration of function.

The muscles acting on the joint are usually damaged and may immediately lose their tone and suffer further damage if rest is enforced. Heat measures and graduated muscle contractions are the standbys of treatment; early massage in the form of stroking promotes the absorption of effusion and relaxes muscle spasm. Gentle friction prevents the formation of adhesions. During passive movements the injured joint must be well supported by the operator's hand.

Traumatic Arthritis. — The pathologic changes resemble those in osteoarthritis, and their chief characteristics are that they occur only in the joint which has been subjected to injury. Rest is the most important initial physical therapy measure; after the acute symptoms have subsided, gradual mobilization, support by elastic or leather and protection from strain by correcting posture are advisable. As a general rule, when a joint is restricted in movements in all directions, the joint should be rested and not manipulated, because such limitation usually means that the joint is or has been in the state of acute arthritis. If movements are only limited in some directions, the joint may be manipulated with due care.

Diathermy is the most effective measure to improve local circulation and speed up the subsidence of inflammation, and serves as an introduction

for active and passive movements. Daily treatments are indicated. Graduated muscular contractions or massage should be also systematically employed.

Stiff Joints. — Many instances of joint stiffness following sprains for which rest and lotions were used are due to the immobilization and not to injury. Likewise, the flabbiness and weakness of muscles around a joint are due to reflex atrophy as these muscles usually are being supplied by the same nerves as the joint. The early use of appropriate physical measures may prevent most ankylosis, while later when there is serious destruction of cartilage or marked deformity of the adjoining joint surfaces physical measures do not promise the best results.

The principle of treatment in suitable cases is to relax the fibrous, contracted tissues by a thermal measure, preferably, diathermy or use of luminous heat or a hot whirlpool bath as its substitute, and to follow this by active exercise, massage and manipulation. Graduated muscular contractions by the surging faradic or the static wave current applied with a molded electrode over the joint will often help by their gentle stretching and exercising effects on muscles and periarticular tissues. Appropriate massage movements are most helpful in stretching adhesions. After preliminary warming, deep stroking is used at first, followed by deep kneading of the muscles above and below the joint. Friction movements may be applied over the joint, and finally passive movements and resistive exercises are added. A fairly severe reaction may follow such heavy massage, and in such cases temporary rest and immobilization have to be applied.

Fractures. — The modern treatment of fractures recognizes that the pathologic change present is a solution of continuity of a bone situated in soft tissues which have been extensively damaged. Consequently the early employment of efficient physical therapy to the damaged soft parts will obviate the necessity of much of so-called after-treatment of fractures and will be productive of much earlier and more complete functional and anatomic recovery. The object and means of physical therapy vary in the three stages of fracture treatment. In the "prereduction" period, when fractures are accompanied by severe trauma to the surrounding soft parts, with extensive hemorrhage, and reduction, open or closed, must be delayed for several days, the cautious use of heat and massage may improve the condition of the soft parts and permit application of definite treatment much sooner than would otherwise be possible.

In the "postreduction" period the aim is to remove the changes caused by the fracture and manipulative procedures. Elevation of the affected part, sedative massage of the whole extremity and a constant low degree of heat are used in conjunction with counterbalanced suspension and active mobilization of the part by the patient. "Muscle setting" is a very important active form of voluntary muscle contraction which the patient may be taught to use even when the extremity is completely encased in plaster dressing. It consists of the patient's "setting" or contracting actively the individual muscles of the injured extremity, without any actual movement of the joints; this is done several times a day and serves to increase circulation and maintain some of the muscle tone. In addition, some surgeons laud electrical stimulation for maintaining muscle function when used gently and painlessly and without causing spasm.

"After-treatment" begins when bone healing has advanced sufficiently to allow discarding of splints or apparatus. Here physical therapy finds its greatest use in treating stiffness and atrophy following prolonged immobilization. In this stage all methods of physical treatment may be employed

according to indications: whirlpool bath, paraffin bath, contrast baths, heat, massage and exercise. In late stages of fractures physical therapy is only an adjuvant; full restoration of function depends chiefly on the efforts of the patient to regain the function by normal muscular activity. All physical therapy can do is to make it easier for the patient to carry out this task.

It is generally recognized that in fractures with great displacement massage and mobilization have to begin much later than in fractures with little deformity and the fragments held in good position. This is, of course, a matter for the attending surgeon to decide and as he assumes the responsibility for instituting the early treatment, it is expected that he will supervise the treatment at first and issue definite instructions for the removal of splints, joint movement with the splint or without it and the type and duration of massage and exercise.

It is impossible to give other than general rules for each stage; the particular movements will have to vary with the type and location of fracture and the immediate response to treatment. The same considerations relate to the combination of active and passive movements with massage. Gentle surface stroking applied for a few minutes is always the first treatment in fractures. It should be preceded by mild external heating and, as a rule, no other massage movement should be applied until the knitting of the bony ends is firm. Great care must be taken to support the fracture. If it is possible a minute amount of motion should be performed in the joint distal to the fracture if it can be done without danger of displacement of the fracture ends. Hence this is preferably done by the surgeon at first. After six or eight days add light friction and careful passive movements in all neighboring joints and after ten days add kneading of muscles above and below the injury. After three weeks, treatment may include striking, kneading, friction and active movement in neighboring joints.

After four weeks more vigorous massage may be employed with active movements. The patient must be encouraged to take movements by himself. If the injury is to the upper extremity he is urged to use his hand and arm daily in small tasks. If the injury is to the lower extremity the patient is urged to use crutches and move the leg in active exercises. It is usually six to eight weeks or longer before the patient can bear any weight on the injured limb. In the chronic stage, much depends on the skill of the treatment as to whether the patient quickly recovers his power and movements. The patient must feel it is up to himself to get well. Massage is a means to an end and the patient must be forced to realize this and work himself through exercise to assist in the recovery.

Amputations. — An important function of physical therapy is the preparation of an amputation stump for early and efficient function. Heat, massage and early exercise are the means. Either whirlpool or contrast baths are used to improve the circulation in cyanotic, cold and painful stumps and in those with a low grade inflammatory condition or ulceration. Such baths are also beneficial when there is persistent edema or excessive periosteal connective tissue formation; they relieve the pain caused by poorly fitting prostheses at weight-bearing points. They should be used daily, and the patient may be instructed to use contrast baths at home with two ordinary pails. Massage can be started six or seven days after amputation if there is no infection. After heat treatment, superficial and, later, deep stroking, kneading and friction are given in successive order and are followed in turn by passive exercise and stretching.

Early exercise of the amputated limb results in disappearance of the edema and further shortening of the periods preparatory to fitting the arti-

ficial limb. Learning the mechanics of standing and walking with an artificial limb involves reeducation in coordination of movement in the muscles of the stump and of tactile, muscular and joint sensation in the remaining part of the limb. After learning the mechanics of walking, the patient puts it into practice by walking between parallel bars used for support. When this has been mastered he is taught to walk with short steps, using two canes, and then to walk with longer steps, using only one cane.

Chronic Osteomyelitis. — Physical therapy is of material help in aiding this condition. The pathologic changes consist of one or more discharging sinuses, a sclerosing osteitis, induration of surrounding soft parts, atrophy of muscles and stiffness in neighboring joints. Penetrating heat will improve the blood and lymph supply and it also relieves pain. Short wave diathermy by the inductance coil or air-spaced technic is especially suitable for deep heating because it overcomes the handicap of irregular bony surface or of too extensive local processes preventing good electrode contact and position. On account of slow heating of bone a minimum of thirty minute treatment periods is advisable. Luminous heat may be used simultaneously over the open sinus.

General ultraviolet irradiation should be used because of its effect on calcium metabolism. Other physical measures for overcoming the muscular atrophy and the stiffness of joints may be instituted according to the circumstances.

Tenosynovitis. — Inflammation of a tendon sheath may follow a local infection, an infectious disease or, most frequently traumatism; the trauma may be one severe blow or multiple minimal strains or sprains; occupational tenosynovitis is due to habitual overuse of a tendon or group of tendons. Tenosynovitis generally affects the sheath more than the tendon itself; its presence is recognized by the patient at first not so much on account of pain, which is usually slight, but because of the feeling of weakness when he attempts to bring the tendon into use; a palpable and audible creaking (crepitus) may be noted when the tendon is active. The crepitus is due to a deposit of fibrin between the tendon and the walls of the sheath; if, subsequently, effusion of any quantity takes place, a fusiform swelling becomes visible along the tendon and the crepitation ceases. In chronic cases, especially when infection occurs, granulation tissue forms within the sheath, firm adhesions develop and interference with free action and marked pain result. The tendons commonly affected are those of the wrist, thumb and ankle.

Rest is the first consideration in the treatment of acute tenosynovitis. The activities which cause discomfort and pain should be avoided. Luminous heat for periods of one hour twice a day should be instituted at once or else diathermy given by any suitable method for one-half hour daily. In cases which do not respond satisfactorily or which appear as severe cases from the beginning light splinting should be applied in the form of a removable molded plaster of paris splint or a supporting sling in case of the shoulder. Adhesive plaster strapping for fixation of ankle, fingers or wrist joint may be used, permitting short wave diathermy to be applied through the dressing. Massage is usually not well tolerated at the beginning. In many chronic cases adhesions develop because of the thoughtless habit of immobilizing the parts for too long a period. Local heating by paraffin or whirlpool bath or by diathermy, followed by massage, will tend to soften and break up the inflammatory exudate, if it is not too densely contracted.

Bursitis. — Bursal sacs are found between a muscle or its tendon and bone, between two muscles or tendons or between the skin and some harder tissue.

They make movements possible with a minimum of friction where surfaces move on another. Being of the same anatomic structure as tendon sheaths and joint cavities, bursae show the same pathologic changes after trauma as after infection. Early local treatment may consist of heat, particularly diathermy and absolute rest of the part in a position relaxing pressure on the affected bursa, and also gentle massage up to the threshold of pain for the maintenance of muscle nutrition and for relaxation of spasm. Aspiration may be indicated in the early stage as long as the bursa is markedly distended with fluid. In the later stage it is important to prevent fibrous adhesions in or around the bursa; hence while diathermy is being continued, gentle manipulations and active stretching exercises are advisable.

Subdeltoid bursitis is the most frequent form of bursitis. Its cause is most generally, repeated mild trauma with the arm in an abducted position or a single injury leading to a lesion of the tendons attached to the greater tuberosity, particularly rupture of fibers of the supraspinatus tendon. This is the ordinary primary acute bursitis. In bursitis with calcified deposits there is usually a history of prior attacks of pain and disability at long intervals over a great period of time. Later, after a slight trauma or strain, the shoulder may be thrown into almost sudden spasm with great pain and disability, which prevents use of joint on account of the suffering which the slightest movement entails. Roentgen ray examination reveals the presence of smaller or larger deposits of calcareous material, which show as shadows of varying density in the region of the bursa.

Treatment of this condition consists along the general lines indicated. Diathermy has proved to be the chief standby for the relief of pain and muscle spasm and for the promotion of the absorption of the calcareous deposit. However, in the very acute stage of bursitis infra-red or luminous heat is often the only measure that the patient can tolerate; a small lamp of 150 to 200 watts kept on and off for one-half hour to one hour several times a day serves to relieve the pain and relax the spasm. In very rare instances any form of heating causes aggravation of symptoms. In these the placing of wet ice packs over the shoulder for the first twenty-four to forty-eight hours with the joint at absolute rest gives the patient much needed relief. Irrigation of the bursa is also advocated in acute cases.

After the acute stage or in cases which do not start as acutely, the careful application of diathermy can begin. The method of air-spaced pads is ideal for avoiding the slightest pressure in the tender tissues and in keeping the amount of heat down to a comfortable minimum. Treatments are administered daily or even twice a day. As tenderness subsides, transverse application of condenser pads can be instituted, or, still better, the application of long wave diathermy or contact plate short wave diathermy, for it allows exact localization of the heating current. In further treatment massage, manipulation and gentle stretching of the shoulder are added. The patient should be taught how to take exercises to improve the abduction of the shoulder; the commonly used form is creeping up the side of a door or up the wall with the fingers.

Back Injuries. — Physical therapy plays an important part in the management of back injuries; if its results are not as clearcut and dependable as in other types of injuries this may be due to the often confused pathology and to complicating factors related to compensation.

Immediate and proper rest is most desirable for recovery of back injuries; it must be kept up from one to three weeks according to the seriousness of the injury. The back must be protected to avoid protective muscle spasm. If muscle fibers or ligaments are torn or pulled away a new pro-

tective muscle function is immediately instituted, which persists until proper and adequate rest conditions are established. If not soon replaced by proper outside support, this spasm becomes a source of pain and disability in itself. In further physical treatment heat and massage are added; either long wave or short wave diathermy for thirty minutes or more, followed by massage, the surging faradic current or, if available, the static wave current and sparks. When there is no more muscle spasm simple exercises of the gluteal and abdominal muscles should be instituted to improve posture, restore coordination and increase muscle power. In stubborn cases of local tenderness due to chronic myositis ion transfer with mecholyl or histamine may give satisfactory results; in others second degree erythema doses by ultraviolet radiation are helpful. In all these cases postural exercises, a careful regimen of general hygiene and the alternation of rest and work must be employed with due regard to the individual case.

Painful Feet. — In the management of foot conditions due to strain, injury or infection physical measures are of definite help.

In the common weak foot (flexible flat foot) the ligaments of the longitudinal arch become relaxed and the plantar flexor and adductor muscles atrophic. In acute pain rest and proper support of the longitudinal arch are the first measures; next comes physical therapy in the form of hot and cold contrast baths or baking, gentle massage and, still later, foot exercises to develop the muscles which adduct and invert the foot. Gentle electrical exercise of the foot muscles with a low frequency current, one electrode under each sole, is also helpful. In tight posterior muscle groups of the leg (shortening of the achilles tendon) stretching exercises are indicated.

In painful bursitis under the heel or about the insertion of the achilles tendon, rest, contrast baths, diathermy or ion transfer are of definite value. The same measures are helpful in arthritis involving the numerous joints of the foot.

Trench foot, due to prolonged standing in water or cold wet mud, after antiseptic treatment of blisters and scabs is benefited by dry heat or diathermy by the air-spaced method, and later by massage and suitable exercises.

Affections of the Nervous System

Peripheral Nerve Injuries. — Injuries of peripheral nerves can be brought about by falls, blows, dislocations, fractures, penetrating wounds or continued pressure. The anatomic change in the nerve may be a contusion, laceration or division, with a loss of motor power—flaccid paralysis—and loss of sensation in the part supplied by the nerve involved. There will be immediate complete or incomplete paralysis in the muscles supplied by the injured nerve. If after an injury leading to peripheral paralysis there is a separation of the affected muscles from their trophic center, the nerve will undergo degeneration (distal from the seat of the lesion) or minor disturbances of function. The muscles supplied by the nerve become weakened or fully paralyzed and suffer from lack of nutrition, owing to the separation from their trophic center and lack of exercise. They also suffer from overstretching by their strong antagonists if allowed to remain in a faulty position. The other soft parts, joints, bones and tendons suffer from lack of nutrition and may develop adhesions, faulty positions, trophic ulcers and other pathologic conditions.

In many cases it is clinically impossible to ascertain at first whether the vitality of the nerve axons has been sufficiently damaged or broken to cause progressive nerve degeneration below the site of injury. Electrodiagnosis enables a differentiation to be made after ten days or so between

injuries leading to reaction of degeneration and those which do not. There is no electrical test available which will ascertain whether or not there is a separation of nerve fibers to such an extent that spontaneous regrowth is impossible. However, even immediate nerve suture does not prevent subsequent nerve degeneration. As long as in an injured nerve its ends remain in close anatomic approximation, regeneration of the nerves takes place automatically by the descent of new axis-cylinders from the intact central end at a rate of from 1 to 2 mm. a day, about 1 to 2 inches per month, but restoration of nerve function occurs much later. The anatomic regeneration of the nerve can only be assisted indirectly by improvement of the circulation and nutrition.

Physical therapy holds the first place in the treatment of peripheral nerve lesions; operative procedures will not serve to restore function and only make it possible for the nerves to regenerate. Physical therapy must be initiated promptly to the end that when the nerve regenerates it will activate a mechanism capable of adequate movement. The measures indicated are splinting to prevent overstretching of paralyzed or weak muscles; massage to improve the nutrition of the parts, to prevent adhesions of scars and fibrosis and to conserve the bulk of the muscles; passive movements to prevent deformity from shortening, interphalangeal fibrosis and ankylosis of joints; active exercise to conserve the unparalyzed muscles, to stimulate circulation and to educate synergistic muscles to assume the function of paralyzed muscles; electrotherapy to conserve the vitality, prevent complete atony and increase the contractility of paralyzed muscles, and hydrotherapy and thermotherapy to assist in nutritional conservation and to facilitate other methods of treatment (Pollock).

Splinting is a physical measure of primary importance in maintaining the condition of paralyzed muscles and assuring a position of anatomic rest and complete relaxation of all paralyzed muscles. On the other hand, splinting should not be kept up indefinitely, as prolonged immobilization in itself will cause periarticular joint changes and muscle atrophy.

Luminous heat may be used as an introductory treatment to promote local nutrition and improve skin conductivity and muscular response by its warming action. It is applied for at least fifteen minutes, at a distance of comfortable toleration. Excessive heat is dangerous in scar lesions combined with peripheral nerve injuries; on account of the disturbed sensation and lack of normal collateral circulation it may cause unpleasant and slowly healing burns. The most desirable heating measure when available is the whirlpool bath, at a temperature of 100 to 105 F. for from one-half to one hour. Under the combined action of heat and gentle massage the clammy tender limb becomes warm, red and free from pain and ready for further treatment.

Electrical stimulation is an important measure in improving the condition of the paralyzed muscles. The slow sinusoidal current, beginning with two or three contractions of each muscle, is used at the beginning and gradually increased. In cases with partial reaction of degeneration or only slight quantitative electrical changes, more vigorous stimulation may be employed. Overtiring, however, must always be avoided. Active exercise is instituted as soon as there is any indication of return of active power. Corresponding with the progress of anatomic regeneration of the nerve, the atrophy of the muscles gradually disappears and their response improves. After many weeks or months a time comes when there is the first indication of return of voluntary motion in one or more of the paralyzed muscles. This is proof that the nerve trunk and the motor end plate have regenerated.

Response to the faradic current may return about this time or, as a rule, somewhat later.

Massage as an adjunct can be used to advantage, although there is modern experimental evidence to prove that it is only of slight benefit in preventing atrophy of paralyzed muscles. Only the most delicate form of massage is indicated because, owing to the atrophy of the paralyzed muscles, pressure may be transmitted to the blood vessels, causing paralytic dilatation; thus, heavy massage will defeat the end sought. From ten to twenty minutes of gentle stroking is all the massage which is necessary to aid local circulation and to promote elimination. Manipulation must be carefully used to work loose contracted joint capsules, ankylosed joints and shortened tendons.

After active control of the muscles has begun to return, active exercise and reeducational movements form the most important part of the treatment. Placing the parts in positions where gravity is overcome and then carrying along active voluntary contractions is of great value. These exercises are best after preliminary warming. The risk of giving a patient too much voluntary or electrical exercise must always be remembered.

Traumatic Neurosis. — Treatment of traumatic neuroses is among the most baffling problems. Cases of post-traumatic neurasthenia exhibit abnormal fatigue and irritability, associated with extreme emotionalism and a disproportion between the actual strength of the patient and his supposed weakness. Post-traumatic anxiety neurosis is characterized by a marked hypochondria which concerns itself chiefly with one organ or symptom until it becomes almost an obsession. In post-traumatic hysteria the patient exhibits pseudo-organic signs and symptoms which do not correspond to an actual anatomic relationship but rather to the patient's idea of anatomic relationship.

In the treatment of these conditions the emotional state of the patient is a combination of fear of disability (anxiety), resentment toward the agent responsible for the injury and toward any one, such as the physician, who suggests that the injury is physically negligible. To expect the patient to become free from all symptoms without treatment is almost equivalent to expecting him to admit that his symptoms were "unreal." Therefore, medication and various forms of physical therapy or electrotherapy are very useful in giving him reason to expect improvement and a basis for relinquishing his symptoms. In sleeplessness due to nervous exhaustion a full or three-quarters cold, wet pack is a classic measure for relief. In cases of low blood pressure the static modalities, notably the static head breeze, are helpful. General light baths may be also effective. Such methods, however, must not be unduly prolonged, as they only fix the patient's attention too firmly on his ailments.

Mental Conditions. — In the large field of mental disorders, physical measures, especially in the form of hydrotherapeutic procedures, find wide application for either stimulation or sedation. The systematic application of physical measures as treatment adjuncts increases the patient's well being and reacts favorably to his mental state, constituting a direct approach to his psychic self. In recent years electric shock therapy has been found of definite value in the treatment of depressive states, especially those with psychomotor inhibition or retardation, melancholias, manic-depressive psychoses and early cases of schizophrenia.

Injuries to the Skin and Adjacent Parts

Contusions. — The typical signs of a contusion are swelling, ecchymosis,

discoloration of the skin due to hemorrhage, local tenderness and limitation of motion. Immediately after the injury nothing will give so much relief from pain as cold compresses or an ice bag; the contraction caused by cold will also tend to arrest hemorrhage. After twenty-four hours, hot moist applications or exposure to radiant heat may be started; the latter should be kept up for one-half hour every two or three hours. Hot compresses are less desirable because they dry rapidly. Immersion in hot water keeps the part hanging down, whereas elevation is more important than heat. If there is marked local edema, gentle stroking massage should be given for a few minutes after heating.

Local tenderness not fully relieved by these measures may be further alleviated by a ten minute application of the Oudin current or high frequency stroking. Careful passive motion for a few minutes by the operator and a few minutes active motion by the patient should end the treatment, which is to be repeated at first once daily and later every other day until the condition has fully cleared up.

Burns. — The explosive and incendiary agents of modern warfare are producing a very large proportion of burns among casualties. The primary treatment in all cases of extensive burns (10 per cent or more of the body surface) is prevention or limitation of shock by injection of morphine and the administration of fluids—whole blood, blood plasma or saline solution. The previous teaching of applying external heat to severely shocked patients is now questioned on the basis that cutaneous vasodilatation causes peripheral accumulation of blood and thus contributes to circulatory collapse.

There is no universal agreement as to the best method of immediate local treatment except that the application of some form of coagulating agent appears to be the most practical type of treatment. The National Research Council recommends for immediate application to all parts of the body other than the face, hands and genitalia, a water-soluble jelly containing 10 per cent tannic acid and 5 per cent sulfadiazine or, in the absence of such a preparation, tannic acid ointment. A sterile gauze covering should be used over the injured parts. In the later stages of treatment a heat tent or, in cases of extensive burns, a thermostatically controlled saline bath may be employed.

After all sloughs have disappeared and the wound is cleanly granulating, ultraviolet irradiation may be employed to promote regeneration or to prepare the field for skin grafting. One has to be careful to apply minimal dosage only because the newly formed epithelium is very sensitive to the short ultraviolet rays. The burn is cleansed and covered with a film of thin paraffin; ultraviolet irradiation from a mercury vapor lamp is given with a first degree erythema dose (two minutes at 30 inches) and repeated daily. The film of paraffin acts as a filter to keep off the short ultraviolet rays (below 2,400 angstroms) and serves as an innocuous dressing between treatments. If the lesion is markedly infected, a 50 per cent, heavier dose is given in the first treatment and the milder dosage continued.

It is important that in the stage of healing the development of contractures be minimized by active and passive motion and early massage and that this treatment be kept up for a sufficiently long period.

Small burns can be treated with the water-cooled ultraviolet or thin window lamp in first degree erythema doses, preferably through a thin paraffin covering. These lesions can be kept dressed with plain gauze pads soaked in paraffin and the irradiation repeated daily.

Cold Injuries. — Skin lesions due to freezing can be classified as follows:
(1) lesions without destruction of tissue, circumscribed cold-induced lesions

of the skin, such as first degree frostbite, erythema and chilblain; (2) lesions with destruction of tissue, consisting of (a) second degree frostbite, erythema with blister formation and superficial ulceration, and (b) third degree frostbite, i. e., frost gangrene. Suitable physical agents are the first line of attack in the treatment of frost injuries, since they exert a tonic effect on atonic vessels and produce active hyperemia.

Chilblains are caused by repeated exposure to mild degrees of cold and consist of an inflammatory reaction in the affected parts—toes, feet or fingers, which assume a violet-red color and are swollen and numb. In early cases there may be only constant burning and itching. Diathermy followed by vigorous application of the Oudin current is useful in this condition. For the treatment of the toes and foot it is usually best to follow the air-spaced technic and employ luminous heat in addition during a treatment period of at least one-half hour. It is better to keep the amount of current at a strength causing just comfortable warmth. Short wave diathermy by the coil method offers an alternate procedure. A stimulating dose of the Oudin current should follow both for ten minutes. Daily treatment is usually followed by prompt improvement within a few days. In some cases contrast baths (five minutes in water of 28 to 30 C., one minute in water of room temperature and then in cold water) are of benefit. Stroking and kneading massage in connection with the baths, hot air or diathermy are other useful measures.

Frostbite is the result of extreme cold; it usually results in sloughing of the affected part and needs primarily treatment along conservative surgical lines. After separation of the slough the infected wound may be treated by physical therapy. Some observers report satisfactory results in second and even third degree lesions with short wave diathermy applied with air-spaced electrodes, daily treatment from twelve to twenty minutes with an intensity so small that the patient has no sensation of heat for the first six or eight minutes and feels only a slight warmth between the eighth and tenth minute. Treatments must be systematically administered for weeks, with a sterile petrolatum dressing applied in the meanwhile. Even in patients admitted with dry gangrene only the mummified part was lost with this procedure. Others have seen good results with passive vascular exercise with additional radiant heating.

Wounds and Ulcers. — Whether an ulcer is primarily due to a specific organism or to trauma, secondary infection with pyogenic organisms is always present. Physical measures aid in clearing up this sepsis, in stimulating regeneration of epithelium and, in chronic ulcers, in improvement of defective circulation and poor nutrition.

Ultraviolet irradiation from either an air-cooled or water-cooled source is a generally used measure. The surface of the ulcer must be carefully cleansed of discharges and all traces of ointments. A second degree erythema dose is applied. Preliminary irradiation for fifteen to thirty minutes from a heat lamp is advisable. The ulcer is then covered over with a mild antiseptic ointment, preferably boric acid ointment, and the treatment is repeated two to three times at two to three day intervals, according to the condition. When the ulcer looks cleaner and new granulations appear, only first degree erythema or suberythema irradiation should be employed, preceded by one-half hour of luminous heat irradiation at a distance of comfortable warmth.

In chronic leg ulcers where the circulation is poor, the hot whirlpool bath at 105 to 110 F. serves to cleanse the ulcer and to improve circulation

of the leg. It is applied for one-half hour and followed by ultraviolet irradiation.

The galvanic current is a valuable alternate measure in particularly resistant cases, in the form of copper or mecholyl ion transfer. Copper ionization is especially useful in deep ulcers with induration and sloughing. It is administered with the following technic: All interstices of the ulcerated surfaces or sinus are packed with small pledgets of cotton soaked in a 1 per cent solution of copper sulfate. A suitable metal plate is placed on top of this layer and is held in position with a rubber bandage. Treatment is applied for ten to twenty minutes at a suitable strength of current according to the condition. For an ulcer of a silver dollar size from 3 to 5 milliamperes of current may be employed for ten to fifteen minutes; this treatment is repeated once or twice within a few days according to the change in the appearance of the ulcer.

In varicose ulcers excellent results are obtainable with mecholyl ion transfer. The technic consists in wrapping around the foot and leg reinforced asbestos paper saturated with 0.5 per cent solution of mecholyl and connecting this to the positive pole. A dispersive pad is connected to the negative pole. The ulcerated area is not covered during treatment until a firm scab has formed over it. Twenty to 30 milliamperes of current is used from twenty to thirty minutes and treatment generally given two or three times weekly.

Infected wounds respond to ultraviolet irradiation applied with the same technic as for ulcers. Preliminary exposure for one-half hour to luminous heat or infra-red rays is even more important. As a matter of fact many of these wounds improve rapidly on heat irradiation alone, applied daily for thirty minutes or longer, at a distance of gentle warmth.

Scars. — Light superficial skin scars are amenable to treatment by the softening effect of the negative pole of the galvanic current. A gauze pad soaked in 2 per cent saline solution is applied over the scar, and a metal plate placed in top of this is connected to the negative pole, while a "dispersive" pad is connected to the positive pole; a current strength of 2 to 20 milliamperes is employed, care being taken to avoid burning. This chlorine ion transfer is followed by suitable massage for stretching of the softened scar.

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PROGRESSIVE RELAXATION IN PHYSICAL THERAPY

I. An Experimental Course for Student Technicians

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Although progressive relaxation has not previously been listed among courses taught by approved schools of physical therapy, so far as can be determined, the clinical value and simple technic of Jacobson's¹ methods seemed to warrant an experimental class. If the students became skillful, they might take over much training of patients under the physician's supervision. Even a rudimentary knowledge of the physiology of relaxation would be useful in many of the routine procedures of physical therapy. A course in relaxation was therefore started on Oct. 27, 1942, as part of the course in physical therapy given by the Cleveland Clinic Foundation.

The students' schedule was already crowded; in addition, some girls spent two or three hours a day commuting, and two kept house for their families. The course was accordingly planned to present the essentials of both theory and practice with a minimum of home work. Although considerable reference reading and outside practice were recommended, the only requirements were sixty-four pages of reading and, in place of a final examination, a written progress report from each student.

The course in relaxation is summarized in table 1 and the students' progress in table 2. Briefly, an hour class for eleven students was held twice a week for four weeks. Material was presented in lectures averaging fifteen minutes each, and in five minute demonstrations, with practice periods lasting thirty-five or forty minutes, as a rule.

It was not possible to analyze in detail the skill in relaxation attained by each pupil. But from observation of the class as a whole during and after practice periods, from the girls' comments to the instructor and to other teachers in the school, and from their final reports, a fairly definite opinion could be drawn. The general impression was that all girls but one became well relaxed while lying on the cots and massage tables, and that they continued to relax during the two short periods of sitting in chairs. Some of them learned differential relaxation to the point of noticing and releasing certain superfluous tensions during daily activity. Few or none gained expert control over the delicate tensions associated with mental processes, although most of the students apparently relaxed large muscle groups during practice periods until they were asleep or practically without mental activity. A trained nurse observing the class at the close of one practice period commented that the students seemed to be "out cold, as if they had taken a drug," and also noted that it took some of them about five minutes to rouse themselves after dismissal.

Undoubtedly two factors were a great help in teaching a fairly well advanced technic of relaxation in so short a time. First, the girls themselves were ideal subjects. Picked for the school from a large number of applicants, they were unusually intelligent and cooperative, and were keenly interested in all phases of physical therapy. Most of them had been trained

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TABLE I. — *Outline of Eight Hour Course in Progressive Relaxation.*

Lecture and Discussion		Demonstration and Practice	
Subject —	Muscle Group —	Instruction —	
1. Scientific approach to relaxation; summary of Jacobson's work, clinical and experimental	Left biceps	1. A. Tense against pressure, relax B. Tense against slight pressure, relax C. Raise forearm half way, relax 2. D. Raise forearm 1 inch, relax E. Raise imperceptibly, relax F. Imagine raising arm slowly, then imagine letting it go	
2. Beginners' difficulties: restlessness, rigidity	Both arms, all muscles	1. A. Tense till arms are rigid, relax B. Tense to half the previous rigidity, relax C. Tense imperceptibly, relax 2. D. Tense to moderate rigidity, relax E. Tense imperceptibly, relax F. Imagine tensing, imagine relaxing, both slowly	
3. Outline of final report from students; purpose of report; reading list	Left leg, 6 muscle groups (flexors and extensors moving foot, lower leg, thigh)	1. A. Tense and relax each muscle group extremely, with movement, in succession B. Tense all 6 groups at once until tension is felt, relax 2. C. Bend foot up toward shin, relax D. Flex only enough to feel tension, relax (If student was well relaxed, on second visit instructions A, B were repeated; if not relaxed, C, D were given to draw attention to muscle sense.)	
4. Meeting objections raised by tense subjects; patient stresses discomfort, instructor muscle training	Abdominal and breathing muscles, 3 groups (those that pull in abdomen, raise trunk, take deep breath)	For each of 3 groups in succession: 1. A. Tense with movement, relax B. Very slight movement, relax 2. C. Tense very slightly, relax D. Imagine tensing, imagine relaxing	
5. Value of relaxation in relieving fatigue and strain; experimental evidence	Back muscles, 3 groups (those that draw head back, pull shoulders together, arch back)	One student demonstrated on another, subject face down, then on back. During practice, only 1 review. For each of 3 groups in succession: 1. A. Tense extremely, relax B. Tense moderately, relax C. Tense slightly, relax	
6. Relaxation and mental activity	Forehead and eye muscles, 4 groups (those that raise eyebrows, frown, close lids, move eyes left, right)	1. A. Raise eyebrows, relax B. Frown, relax C. Shut lids tightly, relax 2. D. Look left, right, at instructor's fingers 3, 2, 1 feet apart; at 1 finger E. Close eyes, imagine looking as in D, don't bother to look 3. F. Imagine rapidly passing motor car, slowly passing bicycle, girl walking; don't bother to imagine NOTE: This practice period was unusually long.	
7. Therapeutic use of relaxation; avoidance of suggestion, emphasis on muscle training	Speech muscles; during last 5 minutes, seated in chair, right and left biceps with lips	1. A. Purse lips, relax B. Smile, relax 2. C. Count aloud to 10, count in whisper, imagine counting, don't bother to count 3. D. Without becoming tense, sit in chair; tense right and left biceps together, relax; purse lips, relax with arms	
8. Misconceptions of relaxation shown in literature; possible application of relaxation by physical therapy technician	Eye muscles; last 10 minutes in chair, thigh muscles (quadriceps-extensors) with eyes	Demonstration: Close lids tightly, relax; imagine flag waving, flower fluttering, full moon; don't bother to imagine Practice: 1. A. Close lids, relax B. Imagine goldfish bowl, flower pot; don't bother to imagine 2. C. Without becoming tense, sit in chair; straighten legs at knee, relax; close eyes tightly, relax lids with thighs	

General Method: Eleven students in class; during practice, students lay on 5 massage tables in one room, 2 cots in another room and 4 cots in separate cubicles, rotating from week to week to insure individual instruction for each. Students were usually visited twice during a practice period, and the demonstrated muscles were reviewed. Instructions were given to the class as a whole during lecture and demonstration, and according to rooms during practice periods. In the *Instruction* column of table, numbers represent visits during each lesson, while letters indicate detailed instructions during each visit. On the average, lecture and discussion lasted 15 minutes, demonstration 5 and practice period 35 to 40.

TABLE 2. — *Students' Record.*

Student	Age	Education	Occupation	Previous Muscular Training	Extra Practice Hours	Grasp of Theory	Final Ability in Relaxation	
							Technic	Muscle Sense
1	24	B. A. Educ. M.A. Spec. Education	Teacher speech cor., crip. child.	Some Phys. Ed.	10	Excellent	Good	Good
2	38	B. A. Phys. Ed. Major	Housewife, clubs	Figure skating teacher	Freq. diff. prac.	Good	Good	Good
3	21	College 3 yr. premed.	3 yr. Phys. Ed. high school	20	Fair	Good	Doubtful
4	26	B. S. Home Economics	Salesgirl	None	7 or 8	Fair	Fair	Good
5	28	B. A. Psychology, Sociology	Service rep. Bell Tel. Co.	Phys. Ed. ath. sports	6	Excellent	Good except speech and eye muscles	Excellent
6	26	B. A. Phys. Ed., M. A. Spec. Ed.	Taught Phys. Ed. crip. chil.	Phys. Ed.	Freq. diff. prac.	Fair	Good	Poor
7	33	B. A.	Housework, sports, clubs	Sports esp. hockey	14	Excellent	Good	Good
8	25	Grad. 3 yr. Phys. Ed. schl.	Masseuse health club	Phys. Ed.	Very little	Apparently good	Good	Good
9	27	B. A. Phys. Ed. Major	School Teacher, Grades	Phys. Ed.	9 or 10	Good	Good	Good
10	27	B. A.	Kept books, accounts, tax reports	None	None	Skeptical	Remained very tense	Failed to localize tensions
11	23	Phys. Ed. B. A., one yr. post-graduate	Psychiatric aide mental hospital	Phys. Ed., taught self to relax	8	Outstandingly good	Excellent	Good

in athletic sports and physical education, and all were currently studying physiology, anatomy, therapeutic exercise and other related subjects. Second, the classes were held late in the afternoon after a full day of lecture and laboratory. Early in the course the students' fatigue at the end of the day made them restless and anxious to get home for the evening's study; but after the second lesson, when relaxation once began it progressed surprisingly well. It is interesting that in most of the final reports the girls mentioned their fatigue as the most important aid in learning to relax, and

doubted that results would have been as good if the class had been held in the morning.

On the whole, the results seemed to justify the attempt to teach relaxation to student technicians in a physical therapy course. In addition to at least an elementary technic, the class acquired some knowledge of the physiology and clinical application of progressive relaxation. They have all become aware of the subject, and will probably become more so with broadening of their clinical experience. Only one student failed to relax, and remained skeptical about the value of relaxation. However, this girl was naturally very tense—so much so that, according to an instructor in physiology, her blood pressure rose appreciably during a period of practice with sphygmomanometers, while she was being used as a subject. And even this student learned to lie quietly instead of moving restlessly throughout the practice periods of the relaxation course.

It is interesting to speculate on possibilities with other professional groups, who might learn to relax as readily and find equally good use for their skill.

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INDUSTRIAL REHABILITATION OF PERMANENTLY INJURED WORKERS *

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The term rehabilitation has become popular during the past few years, although the principles and practice of rehabilitative medicine have been developed gradually over a long period.

Rehabilitation in medicine refers to the methods of treatment and management that help an injured, sick, disabled or handicapped person to recover his former abilities or to develop new powers that add to his physical, economic and social welfare.

A permanent injury may involve only one extremity or the entire body. It may be an actual physical disability or a mental disability such as a traumatic neurosis or shell shock.

The disabling episode may be brought about by disease, such as infantile paralysis, arthritis or heart disease, or by accident. The success of any rehabilitative program is markedly influenced by the thoughts, ideas and experiences that take place early in the disabling experience. One must recognize the serious influence of fear and phobias during the early stage. Most persons are fearful of new and strange experiences. Some are better equipped than others to overcome their fear, and patients face periods of disability with a variety of attitudes. I believe that some persons actually welcome a disabling condition because it constitutes an escape from an unpleasant sit-

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uation. Others face disability with resignation, a sort of neutral attitude. Still others face a crippling disability with an attitude of challenge. These are the positive, aggressive, cooperative persons, who are a source of joy to the physician, surgeon and physical therapy technician.

So important is the initial attitude of the patient that the success or failure of rehabilitation frequently depends on it. Early in a disability a patient will consciously or subconsciously make up his mind regarding the advantage of being disabled. The prospect of a long period of drawing compensation, insurance and lodge benefits, or of receiving a sum of money as a settlement for permanent damage, may be the influencing factor. Also, there are partial cripples or partial invalids who enjoy (even though they do not admit it) the attention, care and freedom from responsibility that their disability gives them. Some one else earns their livelihood and provides the necessities of their existence and care.

To diagnose an injured patient's attitude correctly and to plan the treatment accordingly is the ambition of every treating physician and surgeon.

One of the physician's first duties is to enlighten the patient about his condition. Arthritis, heart disease and even infantile paralysis are not necessarily associated with permanent disability, and the physician must overcome the initial blow that such a diagnosis may create. Too often a patient with a fracture of a transverse process of a lumbar vertebrae gains the impression that he has a broken back, when in reality a fractured transverse process is no more than a fractured rib and should be so treated and, the patient should get well just about as fast as a patient with a fractured rib. The experience of placing a leg fractured at or near the ankle joint in a walking iron and allowing the patient to get up and walk about yields great satisfaction not only to the patient but to the surgeon. Then, when the cast is removed, the patient avoids that period of painful swelling and stiffness so often seen when weight bearing is not permitted.

There is no better rehabilitative physical therapy than purposeful, natural use within the patient's tolerance. Every patient wants some specific evidence from day to day that he is getting better. The physician must establish the confidence of the patient to do the things within his tolerance. Most patients get a real thrill when they can walk without crutches or a cane and when they are first able to walk up or down stairs.

The success of rehabilitation really depends on the patient's "will to get well." If this is lacking, the physician's task is much greater, because he has to develop it before he can show much in the way of results. In talking with patients and encouraging them in their progress, I frequently develop the idea that there is a "real thrill" in getting well. When once they experience the gratification of improvement, steady progress is assured.

There are many inhibiting influences in a rehabilitative program that must be overcome. I have mentioned the early fears of the patient. There are the fears of overcautious relatives or friends and sometimes of overcautious physicians or nurses. I have seen an overanxious employer completely disrupt a rehabilitative program by insisting that a plaster of paris cast be applied to a fracture without displacement or by providing crutches when the attending surgeon wished the patient to use the foot or leg in walking—well intentioned acts, but nevertheless interfering with recovery.

There are insurance companies who do not pay total disability benefits if the patient does any remunerative work. Such denial of benefits occasionally stands in the way of getting a patient back to light work, such as operating an elevator or acting as a watchman. Some of the leading far sighted insurance companies have worked out a plan to pay benefits during

a rehabilitative period of work, which is really the best occupational therapy. Many patients with coronary thrombosis, arthritis, certain lung diseases, neuroses, etc., have been restored to their former earning capacity by such a period, which has demonstrated to them their ability to work. This is the function of curative workshops, occupational therapy clinics and enterprises such as the Good Will Industries, which do a splendid piece of work all over this country.

The job placement of handicapped workers opens up an excellent field for rehabilitation of the permanently injured or disabled person. The co-operative attitude of most employers in providing suitable work for their injured employees is most commendable and does a lot to rehabilitate these employees. Many of them are better employees after their experience.

The influence of the physicians and surgeons who head the medical departments of industries has been distinctly noticed in the job placement of handicapped workers during the last decade. Dr. Daniel Lynch, of Boston, by his persistent devotion to such placement, has rehabilitated many workers who were slated for early retirement because of disabling conditions. Patients with crippled hands are reeducated to do certain types of clerical and office work. Many telephone operators threatened with retirement because of decreased hearing are rehabilitated and kept at work by a combination of amplification of the telephone receiver with a hearing aid device.

What such a program takes is the ingenuity and persistence of some one sufficiently interested in finding the type of work that handicapped or disabled persons are able to do.

Since rehabilitation depends so much on the will of the patient to get well and on his attitude toward rehabilitation, the problem of treatment resolves itself into one of education and supervision. The physician must know exactly the cause and nature of the disability and what will be reasonable and safe rehabilitative measures. With this foundation, he proceeds to create an incentive for the patient to get well. Treatments ease pain; activity and use are encouraged to the maximum of the patient's tolerance; suggestions and encouragement are constantly provided.

It is not enough to convince the patient of his ability to get well; one must convince his relatives and friends. When the time is reached for the patient to go back to the plant or office, his employer, foreman and fellow workers must not destroy the rehabilitation thus far achieved. In this connection it should be emphasized that such patients do not want sympathy or special consideration. It means a great deal to them to be able to carry on actively and to accomplish the same type of work as their fellow employees. They want to earn their wages as their associates do. They do not wish to be looked on as creatures of charity, sympathy or special privileges. They want to stand on their own feet, proud of their achievement.

I should like to present 3 cases of practically complete rehabilitation after permanently disabling conditions. All the patients are earning as much or more as than they were earning prior to their disabilities.

CASE 1. — R. D., an employee of the Railway Express Agency, started to work as a platform man and express handler in 1923. In August, 1929, he was taken ill with arthritis of the dorsal and lumbar spine, so frequently called rheumatism. He had repeated lumbago-like attacks of intense pain and spasm that would put him to bed for weeks at a time, and he was responsible for a family of seven. In 1930, after an adequate period of conservative treatment, he had a spinal fusion as the best prospect of permanent relief. This operation was done at St. Luke's Hospital in Chicago, and he remained in the hospital four months. After a convalescent period of one month he resumed his occupation, in which he has been working ever since. He now works

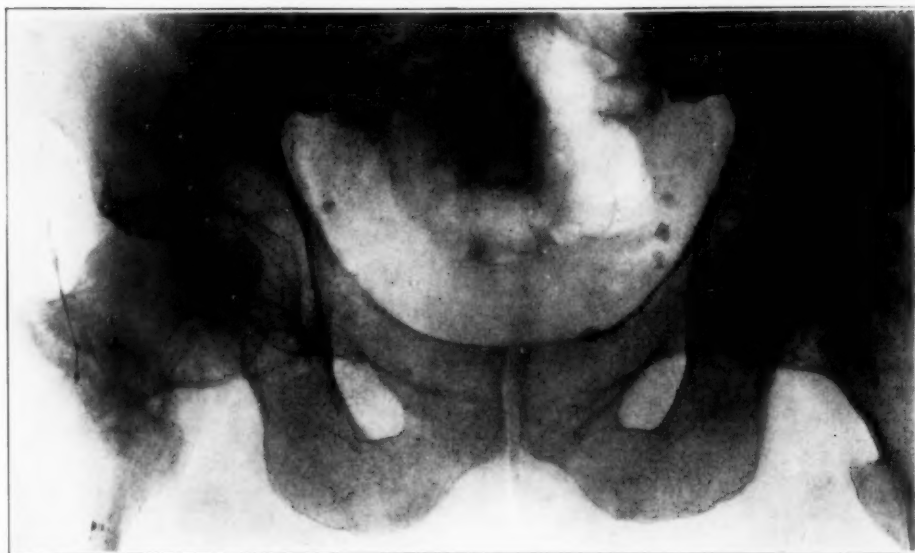


Fig. 1. — Case R. McC. June 3, 1942, three and one-half months after injury.
Intertrochanteric fracture of right femur.



Fig. 2. — Case R. McC. Anteroposterior view, August 25, 1942, showing healing of fracture seen in figure 1.

from 7 p. m. to 3 a. m., earning more money than he did before his disability, and is proud of his achievement. I am informed by his foreman that he frequently does more work than his able-bodied fellow workers. He is a most desirable employee.

CASE 2. — R. McC., aged 50, an electrician, slipped and fell on Feb. 16, 1942, sustaining an intertrochanteric fracture of his right hip. By June 16 he had rehabilitated himself to such a degree that he walked into the office using only a cane. A month later he had discarded the cane. He resumed his work as an electrician on August 5. Although he is assigned to bench work, repairing switches, motors and other electrical devices, he chooses to stand at his bench most of the time rather than to sit down (figs. 1, 2 and 3).

CASE 3. — C. H., a nurse associated with me for fifteen years, in carrying out rehabilitative treatments following injury, was in an automobile accident June 25, 1941, sustaining the following injuries: Multiple fractures of the pelvis; multiple fractures of six ribs, right side; compression fracture of the eighth dorsal vertebra; fracture dislocation, tarsal area of the right foot; fracture of the right tibia extending into the knee joint; extensive hemorrhage into the left thigh, with necrotic sloughing, and internal



Fig. 3. — Case R. McC. Lateral view, August 25, 1942, showing healing of fracture shown in figure 1.

injuries of the abdomen, with laceration of the liver and hemorrhage.

She owes her life to the conscientious and untiring efforts of Dr. Neslen K. Forester, who stayed with her for several nights, administering fluids, transfusions and medication. After the third week her previous experience in rehabilitation stood her in good stead, as she knew what to do and proceeded to carry out such measures as movements of the right foot and knee, which prevented ankylosis. Skin grafting later covered a large area of sloughing. She used slings and pulley devices for movements

of her arms and legs. Passive, active and resistive exercises were started and increased rapidly. She surprised her physician one morning by demonstrating her ability to turn over in bed. Later she sat on the edge of the bed and then in a chair. Presently she started to put weight on her legs, and finally she became ambulatory.

On October 28 she left the hospital, and she convalesced with relatives, making her first trip to Chicago on January 17, 1942. January 19 she started coming down to the office a few hours a day, and she gradually increased the time until on April 15, she was doing a full day's work. She is now actively engaged in rehabilitative physical therapy treatments. She is all the more competent because of her own experience, knowing what the patient is going through in the way of pain and agony but also knowing the thrill and gratification of getting well, which is the reward achieved by those disabled persons who have a genuine desire and real will to get well.

28 E. Jackson Blvd.

INFLUENCE OF HEAT AND COLD ON THE TEMPERATURE OF MOUTH TISSUES *

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Heat and cold are physical agents frequently used for the treatment of the tissues of the mouth. The basis for their use has been largely empiric. This paper contains observations of changes in temperature within the mouth caused by the application of heat and cold. The heating technics employed were those of conduction, convection and conversion.

Temperatures of Localized Areas in the Mouth in Normal Individuals

There is a definite variation in the temperature of the different regions of the normal mouth. A difference of more than 3 degrees (F.) exists between the coolest part, the hard palate, and the hottest, the sublingual area. The other tissues in the order of increasing temperature are the soft palate, oral gingiva, distal portion of the tongue, midportion of the tongue, proximal portion of the tongue, buccal gingiva, buccal mucous membrane and alveolus (table 1 and fig. 1).

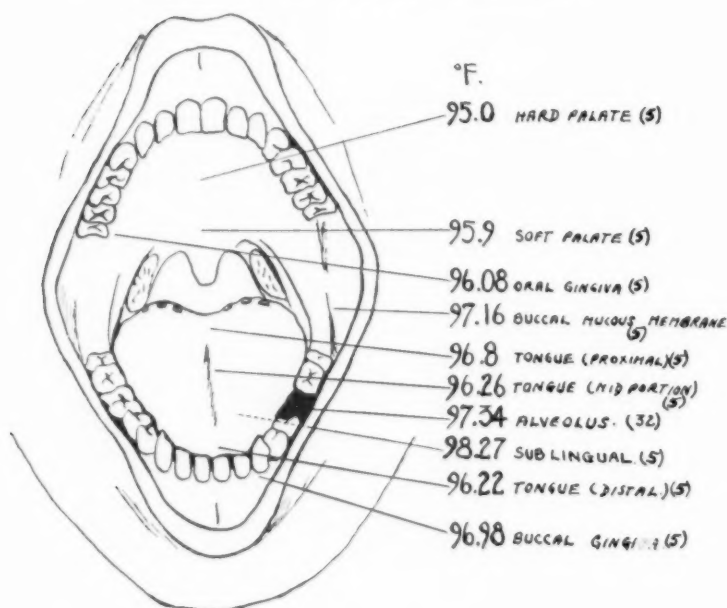
The subjects utilized for this part of the study were normal persons. Temperatures were measured with a thermocouple. Those recorded (except for the alveolus) are the average for 5 individuals. The alveolar temperature is the average of thirty-two readings on different persons.

TABLE 1.—Average Normal Temperatures for Different Areas Within the Mouth

Area of Mouth	Temperature, F.	Area of Mouth	Temperature, F.
Hard palate	95.0	Tongue (proximal)	96.8
Soft palate	95.9	Buccal gingiva	96.98
Oral gingiva	96.08	Buccal mucous membrane.....	97.16
Tongue (distal)	96.22	Alveolus	97.34
Tongue (middle)	96.26	Sublingual area	98.27

* From the Department of Physical Therapy, Mount Sinai Hospital, New York City.

* Read before the Eastern Section, American Congress of Physical Therapy, Philadelphia, April 11, 1942.



TEMPERATURE MAP OF THE MOUTH

Fig 1. — Average normal temperatures.

Studies were then carried out on (1) the temperature of the buccal mucosa as influenced by (a) conductive heat applied to the external surface of the cheek, (b) convective heat applied to the external surface of the cheek and (c) conductive cold applied to the external surface of the cheek, and (2) on the alveolar temperature as influenced by (a) conductive heat applied to the external surface of the cheek, (b) convective heat (short wave) applied to the gingiva, (c) convective heat (short wave) applied to the external surface of the cheek, (d) conductive cold applied to the external surface of the cheek, and (e) conductive cold (ice) applied to the gingiva.

Studies on the Buccal Mucosa

Apparatus. — The apparatus used was a relatively simple one for experimental purposes, but too cumbersome for clinical use. It was designed to supply heat or cold at a relatively constant temperature. The usual hot water bags and ice bags were unsuitable for our purposes because of their fluctuations in temperature, their large size and their interference with the use of temperature-registering devices. The apparatus used consisted of a water container, a coil of copper tubing, a vessel containing ice and water into which the coil was immersed, a hollow applicator and a water pump (fig. 2).

The water was chilled as it flowed from a reservoir through the coils of copper tubing (immersed in ice water) into the applicator. Continuous circulation was accomplished by means of a pump. The temperature of the water in the applicator was maintained between 50 and 55 F. For the conductive heating experiment, the reservoir was filled with tap water at the desired temperature (108 to 114 F.).

The applicator (fig. 3) was fashioned from a small round metal pill box measuring $2\frac{1}{2}$ inches in diameter and $1\frac{1}{2}$ inches in depth. Two openings were drilled into its side. Tubes were soldered into these openings. At right angles to the inlet, an opening was drilled for the fixed thermometer employed to record the temperature of the water. A cotton band and buckle were attached to the back of the applicator to permit it to be fastened to the treated part.

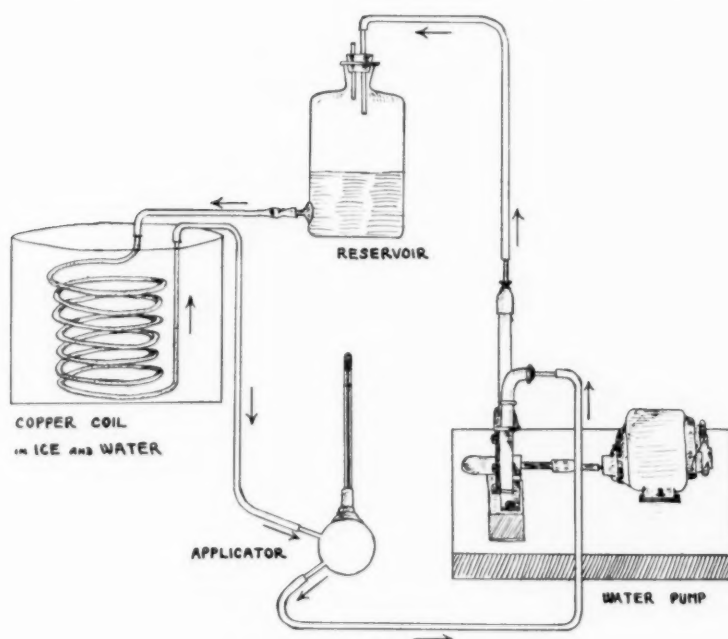


Fig. 2. — Design of apparatus.

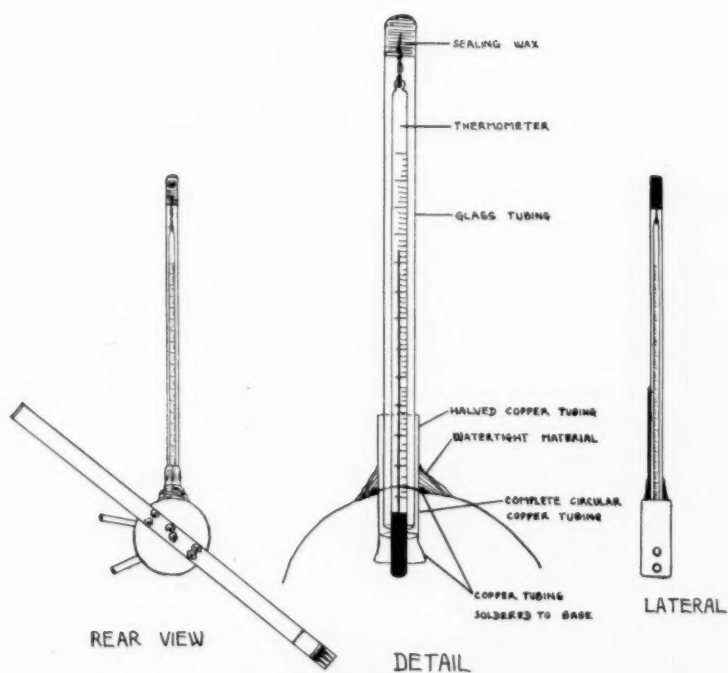


Fig. 3. — Detail of applicator.

We employed a glass alcohol thermometer with its lower end flattened into a circle. A right angle bend at the lower end of the shaft facilitated the application of the flattened circular portion to the mucosa of the cheek.

Results. — Influence of Conductive Heat: The changes in temperature produced in the buccal mucous membrane by the application of the heated metal applicator to the cheek are shown in a representative curve (fig. 4). The

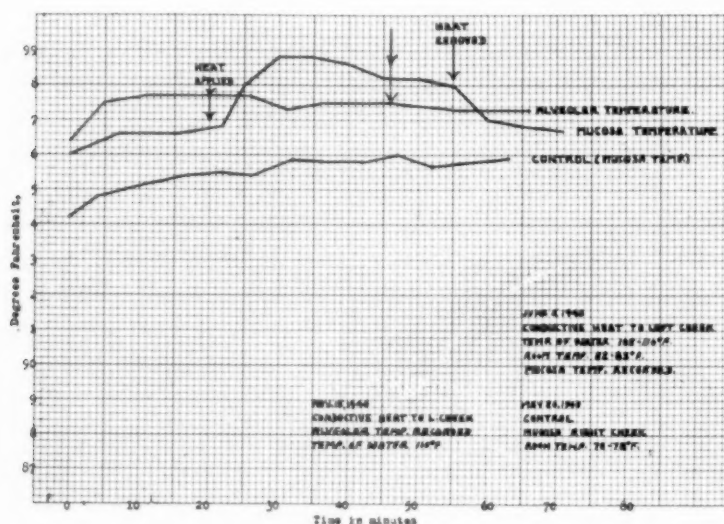


Fig. 4. — Curve showing changes produced in temperature in the buccal mucous membrane by the application of the heated metal applicator to the cheek.

temperature rose about 2 degrees (F.) during the first eight minutes, gradually dropped 0.8 degree during the following fifteen minutes and then maintained itself at about the same level. In about ten minutes after the removal of the applicator, the temperature returned to its original level. The mucosa of the cheek on the other side of the mouth served as a control. After the period of stabilization, the control temperature remained relatively stable. The results of the 10 experiments in this series of observations are indicated in table 2.

TABLE 2.—Temperature of Buccal Mucosa When Conductive Heat (108 to 114 F.) Was Applied to the Surface of the Cheek

Starting Temperature, F.	Maximum Temperature, F.	Increase, F.	Time in Which Maximum Was Reached, Minutes
95.8	97.5	1.7	12
95.4	97.0	1.1	11
95.5	97.6	2.1	13
96.4	97.2	0.8	10
97.0	98.6	1.6	10
96.6	98.8	2.2	10
97.0	98.0	1.0	8
95.2	97.8	2.6	10
96.2	98.9	2.7	23
96.0	97.7	1.7	10

Average starting temperature.....	96.1 F.
Average maximum temperature.....	97.9 F.
Average increase.....	1.75 F.
Average time to reach maximum temperature.....	11.7 minutes

Influence of Cold Applied to the Surface of the Cheek: The contact of the cheek with a cold applicator caused a marked decrease in mucosal temperature. This decrease was most rapid during the first ten minutes and more gradual for the next forty minutes. During the following twenty minutes a slow rise occurred. With the removal of the applicator, the mucosal temperature gradually rose, reaching a level about 1 degree above its starting point after thirty minutes (fig. 5). During the experiment the tempera-

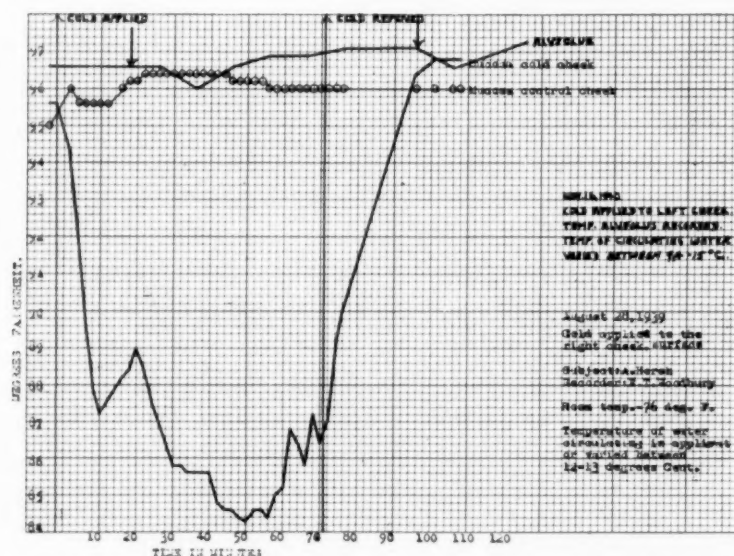


Fig. 5. — Curve showing temperature changes produced by application of cold applicator to the cheek.

ture of the mucosa on the opposite side of the mouth showed a slight rise. The results of the 10 experiments in this series of observations are indicated in table 3.

TABLE 3.—*Temperature of Buccal Mucosa When Cold (50 to 55 F.) Was Applied to the Surface of the Cheek*

Starting Temperature F.	Lowest Temperature, F.	Decrease, F.	Time in Which Maximum Decrease Was Reached, Minutes
97.0	85.4	11.6	56
96.0	86.8	9.2	29
96.5	84.1	12.4	34
93.0	82.4	10.6	26
97.2	85.5	11.7	32
96.2	85.4	10.8	38
95.8	84.8	11.0	50
96.3	81.8	14.5	44
96.6	82.6	14.0	50
95.6	84.3	11.3	50
Average starting temperature.....			96.02 F.
Average lowest temperature.....			84.32 F.
Average decrease.....			11.70 F.
Average time to reach maximum decrease.....			40.90 minutes
(The rate of decrease was greatest during the first ten minutes of cold application.)			

Influence of Exposure of the Surface of the Cheek to Radiant Thermal Energy: After the mucosal temperature was stabilized, the cheek was exposed to radiant heat from a 260 watt carbon filament lamp in a reflector

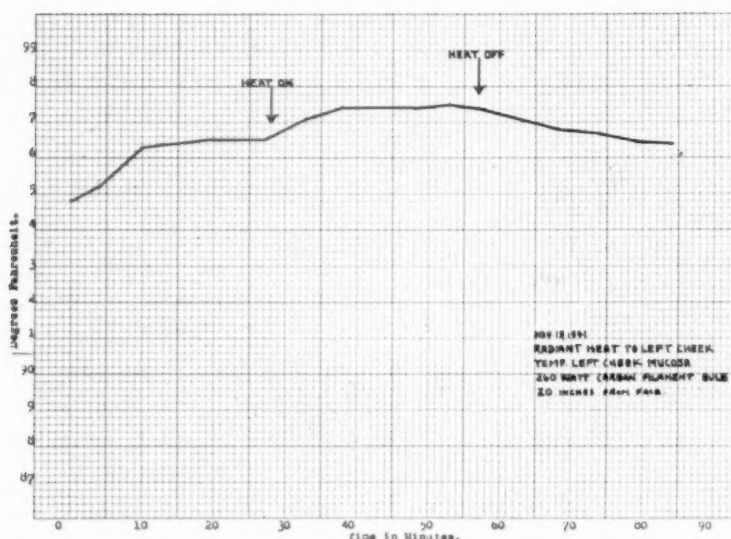


Fig. 6. — Curve showing temperature change in the buccal mucosa by the application of radiant heat to the cheek.

held at a distance of 20 inches. A representative determination showed a gradual rise of 1 degree in the first eleven minutes (fig. 6). This was maintained during the heating application and fell gradually after the heating was discontinued (table 4).

Summary. — A summary of the observations on the buccal mucosa is presented in the following tabulation:

TABLE 4.—*Temperature of Buccal Mucosa When the Surface of the Cheek Was Exposed to Thermal Radiation*

Starting Temperature, F.	Maximum Temperature, F.	Increase, F.	Time in Which Maximum Was Reached, Minutes
96.3	97.0	0.7	15.
96.5	97.5	1.0	10.
96.2	97.6	1.4	15.
96.0	97.3	1.3	16.
96.5	97.0	0.5	15.

Average starting temperature.....	96.3 F.
Average maximum temperature.....	97.28 F.
Average increase.....	0.98 F.
Average time in which maximum was reached.....	14.2 minutes

Technic used	Starting Temperature, F.	Maximum, F.	Change, F.	Time, Minutes	No. of Subjects
Conductive heat to cheek surface.....	96.1	97.9	1.75	11.7	10
Thermal radiation to cheek surface....	96.3	97.28	0.98	14.2	5
Cold to cheek surface.....	96.02	84.32	11.70	40.9	10

Studies of Alveolar Temperatures

Alveolar temperatures were determined by means of a thermocouple inserted into a tooth socket after the major reaction to extraction had subsided (within forty-eight to seventy-two hours).

Results. — *Influence of Heating of Cheek by Conduction:* The metal applicator, heated by circulating hot water (at about 110 F.), was placed on the cheek directly over the region where the tooth had been removed. Observations were

made on 4 patients. In 2 there occurred a rise in temperature of 0.7 degree (F.). In 1 there was a drop of 0.9 degree (F.). A characteristic temperature curve, that for the fourth patient, is shown in figure 4.

Conductive heating to the cheek produces but slight if any elevation within the alveolus.

Influence of Cold Applied to the Surface of the Cheek: The metal applicator was chilled by cold water running through it. Two subjects were studied. In 1 there was a drop of 0.6 degree (F.) in eighteen minutes and then a gradual rise to 0.3 degree above the starting level. The experiment was continued for one hundred minutes (fig. 5). In the other there was a gradual drop of 0.7 degree in twenty-four minutes, which was maintained for eight minutes. The temperature of the water was between 52 and 53 F.

Influence of Cold Applied to the Gingiva: The thermocouple tip was inserted into the alveolus. A piece of ice was covered with one layer of gauze and placed between the buccal surface of the gingiva and the buccal mucous membrane.

Two subjects were studied.

In one, three minutes after the application of ice there was a drop of 5 degrees (F.) and the ice was completely melted. A second piece of ice similar to the first was then applied. In the next minute and a half there was a further drop in temperature of 0.5 degree. The second piece of ice having melted by this time, a third piece was applied without gauze. In a few minutes this melted, and a further drop of 1.6 degree was noted. The total decrease in alveolar temperature in this experiment was 6.7 degrees in five and one-half minutes (fig. 7).

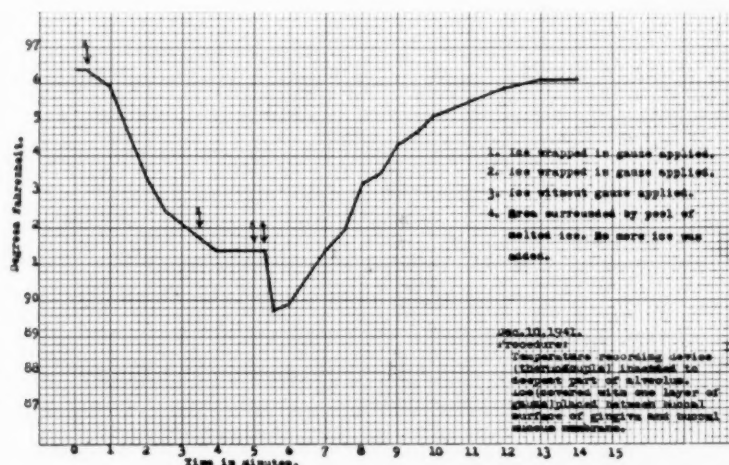


Fig. 7. — Curve showing changes produced in the temperature of the alveolus by the application of ice to the gingiva.

In the second subject, three minutes after application of ice there was a drop in alveolar temperature of 5.8 degrees (F.) and the ice was completely melted. The gauze was removed later, and the temperature rapidly began to rise, until it was somewhat above the starting temperature. It took three and one-half minutes for the return to the starting temperature. The total decrease was 5.8 degrees.

Influence of High Frequency Current (Short Wave) Applied to the Face: The subject was required to remain in a room of fairly constant temperature for a period of twenty minutes, in order to secure stabilization of the alveolar temperature, before any applications were made. After the alveolar temperature was

recorded, air-spaced condenser electrodes were applied to the face and the current turned on for twenty minutes. Alveolar temperatures were taken immediately after the turning off of the current. A 6 meter apparatus was employed. The dose was to the point of thermal tolerance.

The condenser electrodes were applied in three different ways:

1. Equal-sized electrodes were placed on opposite sides of the face. Both small and large ones were used. The large electrodes measured $9\frac{1}{4}$ inches in diameter and the small ones $4\frac{1}{2}$ inches.
2. Unequal-sized electrodes were employed. The smaller one ($4\frac{1}{2}$ inches) covered the region of the cheek over the socket. The larger one ($9\frac{1}{4}$ inches) covered the other cheek.
3. Control subjects were placed in the high frequency field as for a regular treatment, but the current was not turned on. The clicking of an electric timer gave the patient the impression that the current was flowing (see Tables 5, 6 and 7).

TABLE 5.—*Influence of High Frequency Current (Short Wave) on Alveolar Temperature With Equal-Sized Electrodes*

Sex	Age	Before, F.	After, F.	Increase, F.	Electrodes
M	56	96.98	98.78	1.80	Large
F	45	97.52	97.70	0.18	Small
M	54	96.44	96.44	0	Large
F	27	96.26	96.44	0.18	Large
F	35	98.06	98.60	0.54	Large
F	39	96.80	97.88	1.08	Large
M	26	96.80	97.88	1.08	Large
M	36	98.24	97.70	-0.54	Large
M	48	96.26	96.98	0.72	Small
M	53	98.06	99.32	1.26	Small
Average temperature of alveolus before current.....					96.98 F.
Average temperature of alveolus after current.....					97.70 F.
Average increase					0.72 F.

TABLE 6.—*Influence of High Frequency (Short Wave) on Alveolar Temperature With Unequal-Sized Electrodes*

Sex	Age	Before, F.	After, F.	Increase, F.
M	41	96.98	98.42	1.44
F	47	97.16	97.34	0.18
F	31	96.98	96.98	0
M	29	96.98	98.06	1.08
M	32	96.98	97.52	0.54
M	25	96.62	98.60	1.98
F	28	97.34	97.70	0.36
M	63	96.44	96.98	0.54
F	50	97.34	97.70	0.36
Average temperature of alveolus before current.....				96.80 F.
Average temperature of alveolus after current.....				97.52 F.
Average increase				0.72 F.

TABLE 7.—*Control Group for Studies Indicated in Tables 5 and 6*

Sex	Age	Before, F.	After, F.	Increase, F.
M	39	96.98	97.52	0.54
F	41	96.98	96.80	-0.18
F	62	97.70	98.42	0.72
F	53	96.98	97.88	0.90
F	36	97.34	97.34	0
Average alveolar temperature before Athermic S. W.....				97.16 F.
Average alveolar temperature after Athermic S. W.....				97.52 F.
Average increase				0.36 F.

TABLE 8.—*Influence on Alveolar Temperature of High Frequency Radiation Applied Directly to the Gingiva*

Sex	Age	Before, F.	After, F.	Increase, F.
F	13	97.80	98.24	0.44
F	22	97.70	98.06	0.36
F	13	98.06	98.60	0.34
F	16	98.60	98.60	0
F	15	98.96	98.78	-0.18
F	14	98.42	98.42	0
F	14	99.14	99.32	0.18
Average alveolar temperature before.....				98.38 F.
Average alveolar temperature after.....				98.57 F.
Average increase				0.19 F.

A summary of the findings with the three methods is shown in the following tabulation:

	Temperature Before Current, F.	Temperature After Current, F.	Increase, F.
Group 1 (10 Subjects).....	96.98	97.70	0.72
Group 2 (9 Subjects).....	96.80	97.52	0.72
Group 3 (5 Subjects) (Control).....	97.16	97.52	0.36

Influence of High Frequency Current (Short Wave) Applied Directly to the Gingiva: A specially constructed short wave current generator was used. It produced a wavelength of 15 meters and had an output of 10 watts. The gingival electrodes were fashioned to fit directly over the gingiva. A test tube filled with 2 cc. of physiologic solution of sodium chloride when placed in the field between the gingival electrodes for ten minutes showed a rise of 2.88 degrees (F.).

After the alveolar temperature was taken, the gingival electrodes were applied and the current turned on for twenty minutes. Directly after the termination of the current flow, the alveolar temperature was again taken. The results are shown in table 8. For 7 subjects the average increase in alveolar temperature was 0.19 degree (F.).

Summary

1. In the normal person the temperature of the mouth differs in its various parts.
2. After application of conductive heat to the cheek, the maximum elevation of temperature in the buccal mucosa was 1.75 degree (F.). This was reached in 11.7 minutes.
3. When cold (50 to 55 F.) was applied to the surface of the cheek, there was a decrease in the temperature of the buccal mucosa of 11.7 degree (F.). The temperature fell most rapidly within the first ten minutes and then fell slowly, reaching the maximum drop of 11.7 in 40.9 minutes. After the removal of the cold, the temperature rose to its starting level and then exceeded it by a small margin.
4. The application of radiant heat from a 260 watt carbon filament lamp, held 20 inches from the surface of the cheek caused a rise of 0.98 degree (F.) in the buccal mucosa. The maximum elevation occurred in 14.2 minutes.
5. Conductive heat (110 F.) applied to the surface of the cheek caused practically no change in alveolar temperature.
6. Application of cold (50 to 55 F.) to the surface of the cheek caused practically no change in alveolar temperature.
7. Application of ice directly to the gingiva caused a lowering of alveolar temperature of 6.2 degree (F.) in 4.2 minutes.

8. Application of high frequency current (short wave, 6 meter) to the face by air-spaced electrodes on opposite sides of the face resulted in an elevation of alveolar temperature of 0.72 degree (F.). A control series of subjects showed an elevation of 0.36 degree.

9. When short wave current (15 meter, 10 watt output) was applied directly to the gingiva, there was an increase in alveolar temperature of 0.19 degree (F.).

Comment

These observations indicate that the application of dry conductive heat or of thermal radiation from a luminous source to the surface of the cheek has little influence on the temperature of the buccal mucosa, and none on the alveolus. The application of cold to the surface of the cheek produces a marked fall in mucosal temperature but not in the temperature of the alveolus. The alveolar temperature was lowered appreciably by the application of ice directly to the gingiva. Short wave current applied by air-spaced electrodes held on opposite sides of the face influences the temperature of the alveolus very little. The local application of short wave current to the gingiva by means of a special apparatus influences the alveolar temperature even less.

We wish to express our appreciation for the very helpful cooperation of Dr. H. A. Goldberg (Attending Dentist, Mt. Sinai Hospital), Dr. H. L. Perlow (Director of Physical Therapy, Jewish Memorial Hospital); Dr. J. Schroff (Attending Oral Surgeon and Director of Dental Clinic, Jewish Memorial Hospital); and to the members of the Dental and Physical Therapy Departments of the Mt. Sinai and Jewish Memorial Hospitals.

SYMPTOMS AND DIAGNOSIS OF ANTERIOR POLIOMYELITIS IN THE LIGHT OF RECENT DEVELOPMENTS *

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The diagnosis of anterior poliomyelitis does not present as serious a problem as does the ability to prognosticate reasonably early the ravages of the disease in a patient.

The cases incident to epidemic outbreaks, or the grossly paralyzed cases, do not present any great diagnostic problem. The encephalopolioymelitis cases, the bulbar and the respiratory cases often require considerable differential acumen to evaluate but are not apt to be overlooked.

Abortive or mild cases, such as have escaped detection in the past, may be more easily recognized if in the course of examination a few objective symptoms are sought after. Recognition of such symptoms, especially during the seasonal incident period, closer study of possible contagious contacts, plus confirmatory spinal fluid examination will result in improved diagnosis.

However, though recognized more promptly, such cases may be poorly evaluated, and poorly treated, if certain symptoms do not receive proper

* Read at the Twentieth Annual Session of the Academy of Physical Medicine, Boston, Massachusetts, October 16, 1942.

attention. In the light of recent advances, there seems no doubt that early detection of these cases and early treatment of these special symptoms will do much to eliminate ultimate deformities, and probably considerably influence the extent and type of orthopedic assistance necessary to improve residual malfunction.

To those who have investigated the concept brought to our attention by Sister Kenny, a new picture of poliomyelitis is unveiled. Diffuse muscle tightness, usually accompanied by pain, occupies a very prominent role in the diagnosis. Without directed effort to seek out this muscle tightness, proper prophylactic and thorough treatment to prevent deformities cannot be carried out. This muscle tightness has been designated as "spasm." Unfortunately the terminology is probably not clear to us who have always regarded spasm as the thing we see in convulsive states or in spastic upper neuron lesions. We cannot quibble over words, but we do consistently find muscle tightness of sufficient degree to interfere with passive movement of joints through the passive range normal to the particular joint under consideration. Likewise, if while this so-called "spasm" is present we force passive movement, or when the muscle is under forced tension we palpate the tendon of the muscle being stretched, we find evidence of pain in the patient. When this tenseness or "spasm" of muscles is present in such degree as to prevent the examiner from carrying a joint through its normal range of functional movement, it is not surprising that the opposing muscle to the contracted muscle is unable to function at the will of the patient. Such lack of volitional movement may be judged as evidence of paralysis when in reality it is only dysfunction.

This so called "spasm" may be present in such a degree as to produce visual disalignment of normal body contours owing to uneven pull of unbalanced musculature when the patient is at rest. The drooping mouth due to contraction of platysma, the retracted head due to tightness of posterior neck muscles, shoulder deviations due to teres minor, pectoral or trapezius pulls, abdominal asymmetry due to lateral abdominal tightness, foot pronation and apparent foot drop unassociated with anterior tibial or peroneal flaccidity (in the presence of tight calf muscles), genu valgum due to tight fascia lata, are evidences easily demonstrable in any series of poliomyelitis cases. Nurses are trained to close observation. It required a closer observer than the average medical examiner to call these facts to the notice of the medical profession.

For years we have included a Kernig sign, retraction of the head and to a lesser degree tightness in back muscles in the diagnosis of poliomyelitis. We have recognized irritability and muscle sensitiveness. We have failed, however, to appreciate the diffuse presence of muscle tension. We will continue to overlook this if we do not deliberately test the patient for its presence. This is done by observation, palpation, passive movements and attempts at active movements on the part of the patient. Its appreciation will depend on a more thorough appreciation of what the normal static position of the resting body is, and a closer study of the body in motion. This is a brief statement to clarify "muscle spasm" as it is elaborated in the newer concept.

The next symptom is spoken of as "mental alienation." Here again most of those who have observed the work of Sister Kenny close at hand have appreciated what is meant, but quarrel with the terminology. So far we have no satisfactory word to express our meaning. When we consider the degree of tightness present in the muscles of these patients, we appre-

ciate the futility of the patient's will to produce joint movement in the presence of such resistance. This futility of effort results in the patient ceasing in his attempts to move an affected part. When voluntary effort is set aside for a certain length of time, the patient becomes unable to initiate such a movement. A block is set up between volition and effective motor action. We might call it a form of disassociation—proprioceptor reflexes are lost. A more familiar evidence is present in the inability of a patient to contract his quadriceps muscle after operations about the knee, when we know positively that no interruption exists from cortex to normal motor end plate or the muscle fibers themselves. I have explained the futility of effort in overcoming muscle tightness as cause of such mental alienation.

We are all familiar with pain as a deterrent to voluntary effort. It is quite probable that some of the "mental alienation" seen in early poliomyelitis is due to prolonged pain and subsequent functional inhibition.

The third symptom which we now recognize as being present in early and later poliomyelitis cases is "muscle incoordination." Here again we quibble over terminology and still have no better term to designate what we find.

Body mechanics is the action of muscles applied to joints resulting in certain orderly useful functional movements which when properly executed we designate as normal. When for any reason normal body mechanics, smooth, proper and orderly function, cannot or is not willed by the patient, the result is incoordination. We admit it does occur in chorea, tabes, motor disabilities resulting from upper motor neuron lesions. We likewise recognize its presence in dystrophies and extreme muscle weaknesses. We also must evaluate its presence in poliomyelitis.

Normal functioning movements are willed as pictured movements from the cerebrum. These movements are not simple muscular movements but are the effect of coordinating muscles which act together in groups for the production of certain useful function. A single muscle coordinating with different muscles successively may result in several different sets of useful end movements. For example, the flexor carpi ulnaris in contraction with the flexor carpi radialis will flex the wrist. The same flexor carpi ulnaris in conjunction with extensor carpi ulnaris will abduct the wrist. The coordinated relaxation of opposing muscles to those producing the useful positive movement is a further consideration in pictured voluntary movement. Muscles function in coordinated effort to producing useful patterned movements, but different patterns result, depending on which other muscles are willed into action to produce the cerebral picture. When for any reason a patient exerts an effort to move a part and no movement occurs, a subsequent series of movements is set up if the effort continues. The prime producers of the action attempt to function; if they are unable to function, the accessory muscles go into action. If no satisfactory result occurs, the patient continues to flounder about for some other means of producing the pictured movement. The patient will attempt substitution. This substitution is evidenced by distorted, incoordinated, though often somewhat successful, functional effort.

Minor substitutions are often difficult to analyze though obviously present to the trained eye, just as at first thought we may not be able to explain the grammatical reason why an ungrammatical sentence obviously sounds wrong.

I have attempted to rationalize these newer aspects of this disease which we are now observing in case after case of poliomyelitis falling under our

observation. Muscle spasm, mental alienation, incoordination and substitution are all present.

Muscle spasm is the symptom which appears responsible for the development of the other symptoms. Schwartz and Bouman¹ have demonstrated this spasm by recording action currents in muscles. They record spasm in antagonists of muscles weakened by infantile paralysis, in antagonists of muscles showing no evidence of muscle spasm, in the weakened muscle itself and in muscles of the body where no clinical symptoms exist. They believe the spasm in poliomyelitis is of a reflex character. They find no spasm when paralysis is present. They also note that recorded contractions show that spasticity can be stronger than the voluntary contraction of a muscle. In following cases of poliomyelitis they find that as the strength of voluntary contractions increases, spasticity decreases.

If spasm is allowed to remain, a contracture of the shortened muscles occurs, with fibrous replacement and permanent shortening. That persistent spasm may result in true paralysis of a muscle is conjectured by Sister Kenny but has yet to be pathologically determined. Persistent spasm of muscle with prolonged ischemia may result in progressive atrophy. Weakness or persistent contractures in muscles may simulate paralysis. Frank paralysis may be present with symptoms of denervation, loss of volition, complete loss of reflex and loss of tonus with flaccidity. Atrophy may follow and if rapid may be of grave portent. Fibrillation may be demonstrated. Fasciculation may be seen. Chronaxie time is lengthened concomitantly with degeneration of nerve cells.

True paralysis probably does not consistently occur in as many cases as previous interpretations led us to believe. Paralysis is best evaluated after attempts have been made to eliminate those factors which make pseudo-paralysis so commonly evident. This point in evaluation is not reached until proper treatment has been instituted to relieve the muscle spasm, orient muscle movement and coordinate such movement by an energetic treatment routine.

180 Fort Washington Avenue.

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AMERICAN CONGRESS OF PHYSICAL THERAPY

SPRING SESSION EASTERN SECTION

From Cleveland, Washington, Philadelphia, New Haven, Brooklyn, New Jersey, New York and their environs there came to the Spring Session at the Polyclinic Hospital, representatives of Physical Medicine to read and discuss excellent papers prepared on a variety of subjects now engaging our attention and all bearing on ways and means of furthering knowledge of the rationale of treatment.

The Department of Physical Therapy was inspected under the eyes of Dr. Kovács and his staff as the opening feature and this was much appreciated by all who took advantage of the tour. The auditorium was soon comfortably filled and the Chairman of the Eastern Section Dr. Levin, of Washington, was introduced to the audience in an address of welcome by Dr. Kovács.

The first paper, "The Combined Treatment of Refractory Gonorrhea," by Captain Norman I. Cardey, (MC) U.S.A. and First Lieut. Sidney Licht, (MC) U.S.A. of Lovell General Hospital, Fort Devens, Mass., was excellently presented by the latter. The second paper, "Fever Therapy in Luetic Keratitis" was read by B. S. Troedsson, M.D. of Orange, N. J. and showed most painstaking care. Each of these papers represented the greatest attention to detail on the part of the essayists and are examples to be followed. Discussions followed by Lieut. Pruce and Drs. Horowitz, McGuinness and Bierman, the whole giving a succinct summary of the subject of hyperthermy from the pioneering days to these when opportunities in the military forces multiply possibilities for research many times.

Always of interest, since there are so many sufferers amongst us, "A Preventible Foot Deformity in Lower Extremity Injuries," given by First Lieut. Arthur M. Pruce, (MC) U.S.A., of Stark General Hospital, Charleston, S. C., was carefully followed as was "Foot Problems in War Time" by Dr. Henry H. Jordan of N. Y., who showed by excellent slides how the functions of the foot are perverted by improper use and why we suffer as we do. Lieut. Pruce showed and explained some ingenious devices to prevent the deformities following injuries and stressed particularly the matter of early active exercise in these conditions.

"Rapid Rehabilitation Following Certain Shoulder Fractures" by Dr. Harold Lefkoe, started some lively discussion, since the assurance of lack of pain by "the hanging cast" impressed all who deal largely with these casualties. Drs. Armitage Whitman, S. Potter Bartley, Lester Breidenbach, Jerome Weiss and Harold Corbusier all expressed a lively interest in these orthopedic conditions that well repaid a most attentive audience, nearly all kept their seats until 6 o'clock except for the short intermission suggested by Dr. Lefkoe as a "seventh inning-stretch," of which we gladly availed ourselves. Evidently this young man believes in practice as well as preachment for physicians. We enjoyed his lively presentation and assured manner and the response evoked and were no whit fatigued at the close of the afternoon session as so frequently happens when the last paper is reached.

The all important function of dining in these days of stamps and rations was nobly met by "the Poly Coffee Shop" which gave us vegetable soup, roast beef!, three vegetables!, apple pie, cheese and coffee, in generous portions, quickly and deftly served to a roomful of hungry mortals, more folk coming, as usual, than had sent in reservations. Beef, to beefless New Yorkers, was something to approach with the appreciation of a Brillat-Savarin or the rever-

ence of an Escoffier. Lucullus dined with Lucullus—the first beef in weeks for most of us, was quickly consumed with great relish and a vote of thanks to the presiding Goddess of “the Poly Coffee Shop”—“may her hand never grow weary.” After all, chicken is fine, turkey is great, duck and goose satisfying but to the dyed-in-the-wool New Yorker, Beef is King and he likes to share it.

The Evening Session opened with a large sized audience and a number of distinguished guests were present to do honour to the occasion. Dr. Kovács bade us welcome to the Polyclinic and was all dressed up like a penguin as he was to sing at the Liederkranz Spring Concert. Where he found the time to make the quick change from mufti to tails is one of those secrets known only to himself and the late Houdini. Dr. J. Stanley Kenney, who had ended up a full and busy day by honouring us with his presence at dinner, gave us as President, greetings from the Medical Society of the County of New York and expressed friendship, appreciation and understanding of our needs and wants and promised to stand by us in our struggle for proper recognition. President Kenney was applauded to the echo and he may be assured that we are behind him in all his efforts for the County and the State as well as for his promised help for Physical Medicine and for Pathology, Radiology and Anaesthesiology.

The Chairman, Dr. Levin, next called on the various representatives of the component societies to take a bow or give a greeting. Each received due applause for the trouble taken, work done, strength given by his presence and we felt all were going to stand by in the future. Those called on were Dr. Harold Neifeld, President of the New York Physical Therapy Society—host Society to the Session, always an indefatigable worker where Physical Therapy is concerned; Dr. A. A. Martucci, President of the Pennsylvania Academy of Physical Medicine, one of our great standbys in stress and trouble and always smiling in times of quiet; Dr. Harry Eaton Stewart, who told us what was happening in Connecticut and asked us to get together and all pull for Physical Medicine in the days to come in quite a stirring speech; Dr. Walter Zeiter of the Cleveland Clinic, Executive Director of the American Congress of Physical Therapy, who was warmly greeted because of his good work and all his help for the Congress Sessions; Dr. Kristian G. Hansson as President-Elect of the Congress; Dr. J. E. Syracuse of Buffalo as Chairman of the Session on Physical Therapy for the State of New York; Dr. M. J. O'Connor, the smiling representative from Jersey, most of whose members have joined the forces, and Dr. Jacob Gutman, President of the Physical Therapy Session of the Kings County Medical Society who is keeping aloft the banner in Brooklyn where numbers have also been depleted by military necessity. Dr. G. J. P. Barger of Washington brought a message from Dr. Norman E. Titus who sent regrets that he could not be with us and Dr. Levin told of the Washington Club which gets together at breakfast every three weeks to talk over Physical Therapy problems and their work.

Our beloved Dr. Hirsch, without whose presence no meeting is complete, was present throughout the entire day and bore the long hours with more fortitude than the younger ones. We are indeed fortunate to have had, and to have so splendid a champion, so stalwart a bulwark to help us carry on over the years.

The papers of the evening program brought forth a number of physicians interested in circulatory problems. “The Physiology of Peripheral Circulation” added further laurels to the brow of Dr. Harpuder, who presented us with problems enough to work on for years to come. “Fluorescein as a Help in the Diagnosis of Peripheral Vascular Disorders” by Dr. Kurt Lange and “Adaptation of a Photo-Electric Method in Measurement of Circulation Time” by Dr. Jablons were clearly presented and opened up new vistas of a fascinating subject. Dr.

Wilbur Duryee discussed the clinical aspects of impaired circulation and what these new methods as aids may do, with his usual understanding, frankness and clarity. Our youngest discussor, Dr. Blondheim, an interne from Lenox Hill, told of the work done with Fluorescein and of some dramatic results therewith,—he fitted well into our family group.

"Physical Therapy During and After the War" by Dr. Zeiter was eagerly awaited and much appreciated; it was brief and to the point and heartened us generally. Dr. Kovács, back from *tenoring* at the Liederkrantz and again clothed in his working habiliments, mirabile dictu! added some words of comparison between World War I and the present Global War that were well stated and should be well taken.

Dr. Harold Neifeld, President of the New York Physical Therapy Society moved that a rising vote of thanks be given the speakers, the discussors and the Chairman and all those responsible for a very successful meeting which was done with a will.

The Chairman deserves a special vote of thanks for his excellent management of the Session, his promptness, alertness and the way he kept everything well in hand; there were no dull moments, no lagging nor dragging, no long drawn out perorations, everything moved swiftly and steadily in its appointed time. Altogether the Spring Session of 1943 will long be remembered by us New Yorkers who are happy to have distinguished, learned, loyal workers for Physical Medicine come to Gotham to teach and to help the Cause.

Rehabilitation in every phase was the Keynote of this meeting. Rehabilitation is the special province of Physical Medicine—all the research done adds quickly to new means of Physical Therapy for Rapid Rehabilitation. This is the message we must get across to clinicians as a whole.

MADGE C. L. MCGUINNESS, M.D., Secretary.



ARCHIVES of PHYSICAL THERAPY

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.. EDITORIALS ..

THE SPRING SESSION OF THE EASTERN SECTION

While on April 10, Fellows of the Congress came in from New York's West Fiftieth Street into the Polyclinic Hospital for their meeting, a colorful multitude of elephants, animal cages, horsedrawn carriages, and fancy riders gathered in the very same street for entering Madison Square Garden, right across from the hospital. It was the opening day of the circus and wartime necessity for keeping up morale was given for carrying on the Big Show in wartime. And if the circus helped the morale of those in attendance, the meeting of the Eastern Section certainly boosted the morale of the physicians and technicians gathered there from all middle states of the Eastern Seaboard. The great interest in the meeting was shown in the crowding of the large amphitheater to capacity at both afternoon and evening sessions and of numerous leaders of medicine in other fields being present and participating in discussions. They all heard of the earnest and consistent efforts of physical medicine to do its best in helping the war effort and listened to reports on new methods of diagnosis and treatment and on applying standard technics and developing new, more efficient ones, by close clinical observation in civilian practice and in military hospitals. Dr. McGuinness' full report in this issue of the ARCHIVES gives a vivid account of all phases of this enjoyable session. The successful work of her indefatigable self and that of the group associated with her in carrying through this meeting should serve as a stimulus to the other sections and the main body of the Congress to continue their educational work on an increasing scale. As the terrible global conflict goes on and the number of casualties steadily multiplies, the work of physical medicine in aiding the anatomical and functional reconstruction of the disabled becomes increasingly important. It is our patriotic duty and privilege to do our utmost to further education, research and widespread clinical application of physical therapy in war.

THE ADJUVANT USE OF PHYSICAL THERAPY IN GENERAL SURGERY

Physical procedures have found a place of more or less importance in most of the medical and surgical specialties. In internal medicine, in neurology and psychiatry, in cardiology and peripheral vascular disease, in dermatology, in gynecology and in orthopedics the value of physical therapy is well established. In urology, in gastroenterology, in otolaryngology and in ophthalmology, its use is more limited. The contribution which physical therapy can make to the care of patients in the field of general surgery deserves attention.

In elective surgery, the patient's circulatory status can be improved and his resistance to infection enhanced by the judicious selection and application of physical measures for three or four weeks before the operative procedure. The vasomotor control can be improved by the use of hydrotherapy; thus lessening the tendency to shock. For this purpose short local or general

applications of heat followed by graduated vigorous alternating hot and cold sprays and douches accomplish the desired stimulation of the vasomotor mechanism. The preliminary application of heat may be directed toward a local condition such as pelvic inflammatory disease. In selected cases exercise and massage may increase the tonic value of the treatment. Heliotherapy or artificial ultraviolet radiation besides having definite tonic effects, also enhances the resistance to respiratory infections as shown by Smiley.¹ Such a program of preparation, combined with nutritional management and other indicated therapy, should be of distinct value in lessening postoperative complications in elective surgery.

In the operating room also, physical therapy has something to offer the surgeon to improve his operative results. Although Pasteur was the first to demonstrate the presence of bacteria in air, it remained for Wells^{2,3} to show that the air in the operating room is often the most contaminated of any in the hospital. This contamination is in direct proportion to the number of persons present. He also showed that the bacterial content of the air in rooms could be greatly reduced by the use of ultraviolet generators installed therein. Hart^{4,5} made the practical application of Wells' work. He found that the incidence of postoperative infection could be reduced, the temperature curve shortened and flattened, and wound healing improved by ultraviolet irradiation of the air in the operating room. Robertson and Doyle⁶ reported that a combination of air filtration and ultraviolet irradiation further decreased the number of bacteria per unit volume. The contribution of physical therapy to surgical technic in urology, in brain surgery, and in the removal of certain malignant tumors is well known.

It is in the after-care of the surgical patient that physical therapy renders its greatest service. Postoperative pain can be safely and effectively reduced and wound healing hastened by the judicious local use of moist or infra-red heat. In some instances the local application of cold may be desirable for the control of pain or hemorrhage. In slow healing surgical wounds both sunlight and ultraviolet radiation from artificial sources are not only bacteriocidal but directly stimulate healing. It is the writer's belief that the combination of ultraviolet and infra-red radiations found in the carbon arc are more effective than ultraviolet radiation from other artificial sources for promotion of healing in wounds.

One of the most distressing of postoperative complications is pulmonary embolism, since it so frequently occurs when the patient appears to be almost ready to leave the hospital. The high mortality of this accident makes prophylaxis of paramount importance. The prevention of thrombophlebitis by circulatory stimulation with increased rate of venous return from the lower extremities is the aim of treatment. This may be accomplished by leg exercise, by massage, by local contrast applications to the legs, and by deep breathing. Gray⁷ recommended the Trendelenberg position to promote venous return. The bed bicycle is an excellent leg exerciser for use in selected cases. The incidence of pulmonary embolism should be reduced almost to the vanishing point by the systematic use of the measures enumerated.

The same physical therapy employed for preoperative conditioning of the elective surgical patient is effective also in hastening postoperative convalescence. Not only is it of value for stimulating the various physiological processes, but it has a distinct psychological effect in making the patient feel that every effort is being put forth to speed his recovery.

Physical therapy has much to offer the surgeon in the care of his patient. A complete coordinated program of surgery and physical therapy should improve still further the already excellent results of modern surgical treatment.

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PROGRESSIVE RELAXATION

The value of Jacobson's¹ work on progressive relaxation is now widely recognized. Its importance is enhanced during times of stress such as the present. There are very few persons, indeed, who know how to relax voluntarily. Hypertension of muscles is doubtless frequently a factor in the production of several common symptomatic conditions such as insomnia, tension headaches, and speech disturbances. Jacobson² has even demonstrated its presence in essential hypertension. Kleitman³ found that muscular relaxation induced sleep under normal conditions but precipitated sleep in experimental insomnia.

The extensive use of the barbiturates and other soporifics in the control of insomnia is frequently deplored, but often their use seems absolutely essential. In many cases a more constructive method of controlling this troublesome condition would be progressive relaxation. The average physician has neither the time nor the training required to teach his patients proper relaxation. Qualified technicians are necessary to carry out the teaching program. Instruction, however, in the technic of progressive relaxation is not a part of the curriculum of the average physical therapy school.

In this issue of the ARCHIVES, Zeiter and Lufkin⁴ have described an experimental course for student technicians in Jacobson's method of progressive relaxation. Only eight one hour periods were devoted to this course, yet most of the class of eleven students were taught to relax the larger muscle groups. In fact, they were able to relax sufficiently to put themselves to sleep. Some even learned to relax differentially some of the smaller muscles groups. In addition to the technic of progressive relaxation, the students were taught some of the physiology and clinical applications of the procedure.

Progressive relaxation may properly be taught in a physical therapy course for technicians. If the present curriculum does not allow sufficient time to teach it, there would be wisdom in reducing the hours spent on other subjects in order to make room for it. It appears to the writer to be equally as important as passive and active exercise in the technician's armamentarium. It is a phase of voluntary muscle control which few of us possess and yet one which would be of great practical value. It is to be desired that instruction in this method may become a part of the curriculum of each of our physical therapy schools as soon as teaching personnel is available. We are indebted to Zeiter and Lufkin for the description of their experimental course.

(Continued on page 241)

MEDICAL NEWS

Walter Solomon Now a Major

Word has come to the central office that our Editor, Walter M. Solomon has recently been promoted to the rank of Major in the Medical Corps. Congratulations from your staff and many Congress friends.

Graduation at the Cleveland Clinic

April 2nd, 1943, was a memorable occasion at the Cleveland Clinic. It marked the graduation and awarding of certificates to the first group of technicians to finish the course in physical therapy. The graduation exercises were presided over by the new President of the Clinic, Mr. E. C. Daoust. Dr. William E. Lower, who with the late Dr. George Crile founded the Clinic, was introduced as the first speaker and gave the address of welcome to those present. Dr. John S. Coulter of Chicago, Professor of Physical Therapy, Northwestern University and the regional medical officer, Office of Civilian Defense, Sixth Corps Area, gave the address to the graduating class and spoke on "Physical Therapy Today." Then followed the awarding of certificates by the Medical Director of the course, Dr. Walter J. Zeiter. Miss Anna Wetterhuus, the Technical Director, was introduced and presented each member of the class, eleven in number, with the class pin. Miss Anna Jane Evans, Class President, responded for her classmates. Other speakers were Dr. James W. MacMeekin, Lt., U. S. N. M. A., and Miss Edith Malloy, Editor of the annual. A copy of The Annual, entitled "P. T. Reflects of 1943" was presented on behalf of the Clinic and the Medical Director of the course to each graduate and to the guest speakers. It was an outstanding piece of work, containing among other things a photograph of each member of the class and photographs of some of the teaching staff and other prominent members of the Clinic Staff.

Following the formal exercises the graduates and their guests enjoyed a splendid program of entertainment at the Ward Park Manor. A group of Navy personnel in training at the Clinic joined with the graduating class to present several stimulating choral numbers. A really fascinating demonstration of ju-jitsu was made possible by two more boys from the Navy which made the audience realize how valuable this art can be as a matter of self-protection. No small credit is due Dr. Otto Glasser, Head of the Research Division at the Clinic for a very clever impersonation and illustrated talk. The evening closed with the serving of a buffet supper.

Activities of Hospital Association

The board of trustees of the American Hospital Association, at its meeting in Chicago, February 13, voted to hold its annual meeting, the place

and time to be announced later. The board of trustees gave their annual banquet to the presidents and secretaries as a testimonial dinner to Asa S. Bacon, superintendent emeritus of Presbyterian Hospital of Chicago, a past president of the American Hospital Association and for thirty-five years its treasurer, and to Dr. Bert W. Caldwell, executive secretary emeritus and editor of Hospitals. Silver plaques were presented to Mr. Bacon and to Dr. Caldwell.

Association of Industrial Physicians and Surgeons

The annual convention of the Western Association of Industrial Physicians and Surgeons will be held at the Biltmore Hotel in Los Angeles, April 29-May 1, under the presidency of Dr. Benjamin J. Frees, Los Angeles.

Dr. William A. Sawyer, medical director of the Eastman Kodak Company, Rochester, N. Y. (subject not announced).

Philip Drinker, Ch.E., professor of industrial hygiene, Harvard School of Public Health, Boston (subject not announced),

Dr. John H. Foulger, director of the Haskell Laboratory of Industrial Toxicology, Wilmington, Del. (subject not announced).

Lyman D. Heacock, dental surgeon, U. S. Public Health Service, Bethesda, Md., Dentistry's Place in Industry.

Dr. Clifford Kuh, director of the Bureau of Industrial Health, California State Department of Health, Sacramento, Rehabilitation of the War Wounded Into Industry.

Mr. Robert Stormont, Lockheed Aircraft Corporation, Burbank, Rehabilitation of the War Wounded Into Industry.

Lieut. Comdr. Robert S. Poos, surgeon, U. S. Navy, Washington, D. C. (subject not announced).

Additional information may be obtained from the secretary, Dr. Rutherford T. Johnstone, director, department of occupational diseases, Golden State Hospital, Los Angeles.

New Journal on Biochemistry

The *Archives of Biochemistry* recently made its appearance. Published by the Academic Press, New York, the new journal intends to cover the field of chemical structure and reactions of living organisms including proteins, hormones, vitamins, viruses, enzymology, biochemistry and biophysical research in chromosomes, metabolism, nutrition, photosynthesis, plant chemistry, organic chemistry as related to living organisms, colloid science in its biologic applications and chemotherapy. Manuscripts may be submitted to the editorial

office of the *Archives*, 125 East Twenty-third Street, New York, on to one of the editors:

Moses L. Crossley, Ph.D., American Cyanamid Company, Bound Brook, N. J.

Fred C. Koch, Ph.D., Armour & Company, Research Department, Chicago.

Cline M. McCay, Ph.D., Cornell University, Ithaca, N. Y.

Frederick F. Nord, D.Sc., Fordham University, New York.

Frits W. Went, Ph.D., California Institute of Technology, Pasadena, Calif.

Chester H. Werkman, Ph.D., Iowa State College, Ames, Iowa.

Dr. William Petersen Resigns at Illinois

Dr. William F. Petersen recently resigned as professor of pathology at the University of Illinois College of Medicine. It is reported that Dr. Petersen will devote his time to private research on the weather and its effect on human beings, a field in which he has already carried on considerable work. He was a member of the staff at Vanderbilt University School of Medicine, Nashville, Tenn., from 1914 to 1917, when he joined the medical corps of the U. S. Army. He joined the Illinois faculty in 1919 and in 1924 was named to a full professorship.

Report of Georgia Warm Springs Foundation

During the fiscal year ended September, 1942, 571 patients received treatment at the Georgia Warm Springs Foundation, and of these 390, or 68.3 per cent, required partial or full financial aid. The average daily number of patients in residence throughout the year was 101.16, and they received 36,917 hospital days' care. In the previous year 437 patients were treated for a total of 32,590 hospital days' care. A therapeutic pool, completed in June, 1942, is the newest addition to the facilities at the foundation. The physical therapy postgraduate school initiated its formal course of instruction in July, 1941. The course lasts twelve consecutive months and is open only to technicians who have been graduated from schools of physical therapy approved by the Council on Medical Education and Hospitals of the American Medical Association. The foundation reported a gross revenue for the fiscal year of \$263,991.98 and expenditures totaling \$450,803.75, leaving a deficit of \$186,812. The deficit, however, was covered by a grant of \$262,727 from the National Foundation for Infantile Paralysis. The difference of \$75,915 was added to the reserve fund, which now stands at \$1,824,834.

Dr. Bing Joins Institute of Baking

Franklin C. Bing, Ph.D., Secretary of the Council on Foods and Nutrition of the American Medical Association, Chicago, has been appointed director of the American Institute of Baking, Chi-

cago, effective March 15. Dr. Bing was born in Montgomery County, near Philadelphia, Dec. 29, 1902. He received his doctor of philosophy degree at Yale University, New Haven, Conn., in 1930. Prior to joining the American Medical Association in February, 1936, Dr. Bing had been a member of the staff of the department of biochemistry at Western Reserve University, Cleveland. He is assistant professor of physiology at Northwestern University Medical School and a member of the Food and Nutrition Board of the National Research Council, Washington, D. C.

The Kennedy General Hospital at Memphis

The U. S. Army Kennedy General Hospital in Memphis, Tenn., was dedicated January 27 and 58 of its 102 two story brick buildings of colonial architecture are already in use, many of the patients under treatment being battle casualties.

The War Department named the hospital as a memorial to the late Brig. Gen. James W. Kennedy, a member of the medical corps for thirty-six years.

The commanding officer of the Kennedy General Hospital is Brig. Gen. Royal Reynolds, brother of the former surgeon general Charles R. Reynolds and of Col. Frederick P. Reynolds, M.C., U. S. Army, retired, former executive secretary of the New York Academy of Medicine.

Major Rusk in Charge of Recreation and Reconditioning Program

Major Howard A. Rusk, formerly of St. Louis, who has been chief of the medical service at the Station Hospital, Jefferson Barracks, Mo., has been transferred to Washington, D. C., and assigned to the staff of Brig. Gen. David D. W. Grant, the air surgeon, to be in charge of the recreation and reconditioning program for hospital patients or all army air corps hospitals. Major Rusk initiated a novel program for convalescent soldiers while at Jefferson Barracks whereby they were taught during the period of convalescence by means of lectures, moving pictures and other types of visual education and physical exercises. This program includes instruction in chemical warfare, camouflage, radio, model airplane building, a refresher course in mathematics, a basic course in military discipline and a course for illiterate soldiers. The primary purpose of this program is to make use of the time ordinarily lost during convalescence by giving the men instruction in the technical courses needed by the air force. This program was initiated at Jefferson Barracks under the supervision of Col. James R. McDowell, commanding officer of the hospital, and Brig. Gen. David D. W. Grant, the air surgeon. Before entering the service, Major Rusk had been in private practice in St. Louis for many years, where he was associate chief of staff in St. Luke's Hospital and instructor of medicine at Washington University School of Medicine.

Physical Therapy Technicians In All Hospitals — 1942 *

	Physical Therapists	
	Full Time	Part Time
Alabama	18	11
Arizona	12	6
Arkansas	24	1
California	241	59
Colorado	35	11
Connecticut	38	14
Delaware	7	—
Dist. Columbia	40	3
Florida	41	10
Georgia	45	17
Idaho	4	3
Illinois	171	28
Indiana	44	10
Iowa	36	27
Kansas	28	18
Kentucky	18	8
Louisiana	40	8
Maine	21	2
Maryland	45	30
Massachusetts	106	30
Michigan	102	19
Minnesota	38	24
Mississippi	19	6
Missouri	73	13
Montana	12	4
Nebraska	15	3
Nevada	1	1
New Hampshire	4	11
New Jersey	117	34
New Mexico	8	2
New York	437	106
North Carolina	47	19
North Dakota	9	4
Ohio	108	23
Oklahoma	21	8
Oregon	21	22
Pennsylvania	161	62
Rhode Island	14	8
South Carolina	24	6
South Dakota	14	3
Tennessee	28	8
Texas	124	25
Utah	10	3
Vermont	10	4
Virginia	62	16
Washington	46	12
West Virginia	27	3
Wisconsin	65	26
Wyoming	12	1
Total (1942)	2,643	772
(1941)	2,505	602
Increase	138	170
Per cent of Increase	5.5	28.2

* Reprinted with permission, J. A. M. A. 121:1020 (March 27) 1943.

Kenny Treatment Center

The division of crippled children of the Louisiana State Board of Health and the Charity Hospital of New Orleans are now operating a joint project in the hospital for treating acute paralytic poliomyelitis. The new service will be known as the Kenny Method Treatment Center. It will be considered a special orthopedic-pediatric service treating cases of acute paralytic poliomyelitis

under isolated conditions as employed in infectious diseases, according to the Bulletin of the New Orleans Parish Medical Society. The management of patients will be carried out by members of the faculties of the Louisiana State University School of Medicine and the Tulane University of Louisiana School of Medicine, and the hospital staff.

Epidemic Fighters Fly to Argentina

Saturday, March 13, marked a trail-blazing date in the work of your Foundation. On that day Basil O'Connor announced that three experts in the Kenny method were en route by Pan American Clipper to Buenos Aires, Argentina, to aid in fighting an epidemic of polio which has been raging for several months.

The experts are: Dr. Rutherford L. John, of Philadelphia, orthopedic surgeon; Miss Mary Stewart Kenny, ward and co-worker of Sister Elizabeth Kenny, and Miss Ethel Gardner, of Minneapolis, a nurse who has studied with and worked under Sister Kenny for the past two years. Upon their arrival at Buenos Aires, Dr. John and the two technicians will instruct doctors, nurses and physical therapy technicians of the capital city and other Argentinian cities in the use of the Kenny method.

In making public this important assignment to the epidemic battle ground, Mr. O'Connor said: "We are very pleased to grant the request of the Argentine Government for assistance, as forwarded to us by Dr. Juan J. Spangenberg, President of the National Department of Health and Chairman of the Infantile Paralysis Commission of that country."

Then, indicating the potential hemispheric aid available through your Foundation, he continued: "The National Foundation is now ready to render this same type of service to any country in North or South America. Doctors, nurses and physical therapy technicians will be sent, upon the request of the proper authorities, to any American country to teach what we know about the diagnosis and modern treatment of this disease."

Mr. O'Connor pointed out that a small staff of Foundation workers going to a country can teach and demonstrate this work to many hundreds of doctors and technicians. "At the same time," he said, "there is a great advantage in teaching this work to doctors, nurses, and physical therapy technicians when and where the cases actually are occurring, and in using the hospitals and clinics of the different countries under circumstances of greatest advantage to all concerned."

Infantile paralysis apparently is becoming more common in South America. Serious outbreaks have occurred during the past several years in Venezuela, Trinidad, Colombia, parts of Brazil, and other countries, as well as in Argentina.

President O'Connor stated that: "As long as workers are available for this purpose the National Foundation will continue to give such aid as it can to the sister republics of the South."

In thus increasing the scope of our activities—should epidemics strike elsewhere in this hemisphere—the Foundation will not only aid those stricken by infantile paralysis but will, through that manifest assistance, further implement the Good Neighbor policy.

Kelley-Koett Manufacturing Company Awarded the Army-Navy E

The Army-Navy Production Award for Excellence in War Production was presented to the men and women of the Kelley-Koett Manufacturing Company at Covington, Kentucky, Thursday, April 15, 1943.

Dr. Constantine Popoff

It is with regret that we have just learned of the death of Dr. Constantine Popoff which occurred a few months ago. Dr. Popoff was born in 1883 and graduated from the Harvard Medical School, Boston, in 1910. He was certified by the American Board of Radiology and has been a member of the American Congress of Physical Therapy for many years. We extend our sympathy to Dr. Popoff's family and friends.

Leslie W. Rowland

Leslie W. Rowland, head of the medical textbook division of J. B. Lippincott Company, died, January 2, 1943, after a brief illness. Interment was in Arlington National Cemetery, Washington, D. C.

Prior to his connection with J. B. Lippincott Company, Mr. Rowland, who was 51, had been promotion manager of the Cincinnati Enquirer. During the Ohio River floods in 1937, Mr. Rowland organized the newspaper trucks to supply the city with drinking water at a time when drinking water was at a premium. Early in his career, he was a reporter for the old Philadelphia Press. After two years in France during World War I, he became advertising manager for the American Express Company where he remained until 1927. He was publicity director for the first world cruise ever attempted by any travel or steamship company. He was publicity director also for the first "Army Show" which was produced by the famous 7th Regiment in New York City during early 1917.

Mr. Rowland was a regular attendant at the annual meetings of the Association of American Medical Colleges and by his winning personality made many friends among the deans of the medical schools and others whom he contacted there and at other times on his visits to medical schools.

Progressive Relaxation

(Continued from page 237)

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BOOK REVIEWS

CHANGES IN THE KNEE JOINT AT VARIOUS AGES. By *Granville A. Bennett*, M.D., Associate professor of Pathology, Harvard Medical School; *Hans Waine*, M.D., Research Fellow in Medicine, Harvard Medical School; *Walter Bauer*, M.D., Associate Professor in Medicine, Harvard Medical School. Cloth. Price, \$2.50. Pp. 97. The Commonwealth Fund: New York, 1942.

The studies of the so-called normal knee joint that are reported in this book were made over a period of ten years. The authors investigated the knee joints of sixty-three persons. The joints considered were representative of every decade of life from the age of one month to ninety years. The specimens were obtained at necropsy or following amputation and extreme care was taken to exclude joints which had given symptoms of disease or in which abnormalities were found on examination. Whenever possible, each specimen was removed without opening the joint and with the nutrient artery intact.

Careful roentgenographic, macroscopic and microscopic studies were made of each joint. In order to make a systematic investigation and to ascertain the areas affected earliest, each articular surface was studied separately and, likewise, the synovial membranes were divided and studied in various sections. Macroscopic and microscopic changes in the articular surfaces of the menisci were first noticed in joints representing the second decade of life and the evidence was that the changes became more advanced as subjects approached and reached maturity. After the age of fifteen years, and when growth had subsided, the articular margin at the synovial junction increased in prominence. Although there were definite changes in the joints, roentgenographic evidence of marginal proliferation and formation of osteophytes was not present until the seventh or eight decade of life. Minimal changes which were demonstrable by roentgenographic examinations were never consistent with the pronounced macroscopic and microscopic degeneration seen in specimens representing each decade of life. Accompanying the report, under discussion of the findings, are photographs and microphotographs of the changes which took place in the joints during each decade of life. These are excellently presented and do much to clarify the report.

Following the section descriptive of the morphology of the joints, the authors gave an analytic review and interpretation of their findings in reference to the work of many others in the field. The authors suggested that the result of loss of articular cartilage and of elasticity leads with weight bearing, to increased traction on the margins of the joints. They expressed the be-

lief that the resulting stress, plus other non-mechanical factors, leads to hypertrophy and hyperplasia of the tissues in the region of the joints.

The last chapter of the book is a critical review of the theories of the etiology of degenerative articular disease and the authors suggested possibilities for future investigations. The book is indicative of exhaustive study, is excellently written and should be of interest to anyone concerned with the study and treatment of articular disease.

THE METABOLIC COST OF MAINTAINING A STANDING POSITION. WITH SPECIAL REFERENCE TO BODY ALIGNMENT. By *Harriet G. McCormick*, Associate in Physical Education, Teachers College, Columbia University. Cloth. Pp. 84, tables. Price, \$1.25. New York: King's Crown Press, 1942.

This monograph represents an earnest effort to throw additional light on the question of "does 'good' posture take less energy to maintain than 'poor' posture. Is there any relation between the alignment of the body in the standing position and the variation in metabolic increase in the standing rate over the basal rate, and, if a relation exists, how does body alignment vary with this increase in metabolic rate? Is there any relation between the increase in metabolic rate and the scores in a given posture test?" To answer these questions the author stated that it was first necessary to determine what type of standing position the subject should assume. Two factors influenced this choice: first, the necessity of securing a wide range of body alignments and second, the need to eliminate, if possible, all other variables associated with assuming and maintaining this alignment which might influence the metabolic rate. It is clear to the reviewer that a great deal of effort and patience was put into this significant piece of research. Fifty-three subjects, ranging in age from nineteen to forty-three years, were tested for metabolic determinations. A special apparatus was constructed to obtain photographic records of the alignment of the body. Certain bony landmarks were located on the surface of the body of the subject in order to facilitate the later measuring of the alignment in the standing position. The author describes at some length the many details involved in the kind of measuring instruments used and the markings and measurements of the photographs. With mouth piece and nose clip of the metabolism apparatus placed in proper position, three photographs were taken of the subject during the eight minute standing position. Pulse rate was taken three times during the test. The mean and standard deviations of ten determinations are recorded and analyzed in 17 tables.

A mass of data was acquired and analyzed by

means of numerous algebraic equations. The author states that the results seem to indicate that there is a relation between the metabolic increase in standing and certain measures of body alignments. That approximately 33 per cent of the variance in metabolic increase in standing is accounted for by these measures, the remaining 65 per cent may be partially accounted for by other measures of body alignment. She finally concludes: "for the normal healthy individual of average height and weight, it would seem to make very little difference, as far as energy expenditure alone is concerned, what body alignment he assumes in standing" and then adds, "however, in certain cases it might be very important to conserve energy in every possible way. Individuals who are weak-muscled, ill, or under-nourished probably should not be expected to maintain a very erect standing position nor encouraged to attain such an alignment until their health is improved and enough strength and energy is developed to allow them to assume this posture."

After literally wading through a maze of tables, charts and formulas, the reviewer cannot help but conclude that an enormous amount of work was done with little to reward the effort; at least from the viewpoint of practical application. It is difficult for him to accept the approach of the problem by means of metabolism determinations. There are too many variables, and to add proper weight to final conclusions a vast additional work would need to be done. Indeed, the author implies the need of further search. The investigation seems of little practical value to the average reader interested in posture training and evidently is intended for the advanced research scholar who should find this an interesting and painstaking piece of research.

ELEMENTS OF PHYSICAL THERAPY.

By *William W. Worster*, A.B., A.M., President and Founder, California College of Medical Technicians, Former Professor, Clinical Medicine, College of Medical Evangelists, etc. Fifth Edition, Revised and Enlarged. Cloth. Pp. 333, with illustrations. Price, \$4.00. San Gabriel, Calif.: The College Publishing Co., 1942.

This is the fifth edition of Dr. Worster's well-known textbook on Physical Therapy. Dr. Worster is the President and founder of California College of Medical Technicians. He has had much experience in teaching Physical Therapy. This is evidenced in the plain and simple way in which the various branches of Physical Therapy are presented.

In this fifth edition, the subject has been brought up to date. The book is divided into thirty-nine chapters, which are well illustrated. The physics involved is dealt with in comprehensive terms, and the clinical applications are well described. More space has been devoted to therapeutic exercises and a chapter on spastic paralysis has been added. On the whole, every branch of Physical Therapy has been adequately described, although some subjects are emphasized more than others. It may be debated if colonic irrigations need twenty pages and massage only ten. However, this is not important.

The book is well written, the text is complete and interesting, and it is a book perfectly suited for physicians, medical students, and physical therapy technicians. It is especially recommended for our war emergency courses.

PRINCIPLES OF NEUROLOGICAL SURGERY. By *Loyal Davis*, M.S., M.D., Ph.D., D.Sc. (Hon.), Professor of Surgery and Chairman of the Division of Surgery, Northwestern University Medical School, Chicago. Second Edition. Cloth. Price, \$7.00. Pp. 503 with 303 illustrations. Philadelphia: Lea & Febiger, 1942.

This book reveals to physicians and students the possibilities of neurological surgery. An exhaustive treatise on each subject is not covered but it does give detailed instructions on the technic of operations in this field. Facts are presented in an easily assimilative manner which should enable the practitioner and medical student to obtain a more accurate concept of neurological surgery and thus give their patients sound advice. The book is of interest to physical therapy physicians because Davis calls special attention to the various physical agents used in the aftercare of spinal cord injuries. In the postoperative treatment of injuries to peripheral nerves Davis makes a statement that should be an axiom in this treatment: "It is unfortunate that many times nerve ends are sutured and no thought is given to what we consider to be at least of as great importance: *carefully supervised and persistent physical therapeutic aftercare*. If the paralyzed muscles are allowed to shorten and contract or the joints become ankylosed or fibrosed, it is of little value to have sutured a nerve and have its fibers regenerate. Every effort must be directed toward restoration of the normal physiologic function of the paralyzed muscles." Davis further states: "We are firmly convinced that those patients who receive physical therapy show evidences of function much earlier, and the degree of recovery is much greater." The volume can be highly recommended to general practitioners and medical students as giving the principles of neurological surgery.

MIRACLES OF MILITARY MEDICINE. By *Albert Q. Maisel*. Cloth. Pp. 373. Price, \$2.75. New York: Duell, Sloan and Pearce, 1943.

The steady progress of medicine in relation to war time conditions is furnishing a Roman holiday for popular writers with a flair for the dramatic. Maisel's volume is written with the object of portraying glowingly the weapons that save lives in the present worldwide holocaust, the new drugs, devices and technics, which maintain the fighting strength and consequently the morale of American troops in face of mechanical destruction. And so the author passes before the public a lively review of shock treatment by plasma, the closed wound treatment originated by Trueta, the advances of plastic surgery, the story of tetanus toxoid and of the new anesthetics and sedatives and of the remarkable cures by the sulfaquintet. "Flying Doctors" and "Blitz Medicine for Blitz Warfare" are among the final chapters of this fascinating presentation. Since

it has been prepared with the advice and criticism of medical men outstanding in civil practice, as well as in the armed services, it is a volume which can be safely recommended to the public.

NEUROSURGERY AND THORACIC SURGERY. Prepared and Edited by the Subcommittee on Neurosurgery and Thoracic Surgery of the Committee on Surgery of the Division of Medical Sciences of the National Research Council. Cloth. Pp. 310, illustrated. Price, \$2.50. Philadelphia: W. B. Saunders Company, 1943.

This is the sixth military surgical manual edited by the National Research Council. Byron Stookley, M.D., and John Scarff, M.D., wrote the chapter on "Injuries of Peripheral Nerves." The section in this chapter on the methods and devices employed in the nonsurgical care, corrective splinting, physical therapy and the curative workshop is of interest to the physical therapy physician.

Under electrotherapy these authors state: "During the war of 1914-1918, the use of electricity received much attention and achieved excellent results in the treatment of the after-effects of injuries to the peripheral nerves, of injuries to the joints, and of functional nervous conditions." These authors discuss the use of thermotherapy, hydrotherapy, massage, the constant current, the faradic current, the high frequency current, mechanotherapy and the curative workshop. Everyone treating injuries of peripheral nerves should read this chapter. The chapter on Gunshot and Other Injuries of the Spinal Cord was written by Claude C. Coleman, M.D. and Cobb Pilcher, M.D. These authors call attention that in cases of incomplete damage to the cord, spasticity and pain may be partly alleviated and return of function enhanced by the use of passive motion, massage and hydrotherapy. So-called muscle re-education and the use of appropriate braces, crutches, or a wheel chair may return the patient to some measure of usefulness. This manual furnishes valuable information to any army or navy surgeon. As the Surgeon General of the Army has said, "Their application is not confined to military medicine, for most of the wounds and injuries of modern warfare may be duplicated in civil emergencies." Therefore this manual can be highly recommended to all surgeons.

ON GROWTH AND FORM. By Sir D'Arcy W. Thompson. Cloth. Revised. Pp. 1116, 554 figures. Price, \$12.50. New York: Cambridge University Press Department of The Macmillan Company, 1943.

The author has shown how mathematics and physical science can be utilized in the study of growth and form and states that a much wider use of these sciences should be made to solve the intricacies of living things and the life processes themselves. It is a comprehensive and well illustrated text and written in clear and concise English. It is a most unusual volume and is unique in its field. The average physician however, will find the mathematics beyond his knowledge but for those who have a flair for mathematics the book will prove fascinating and open up a new realm of thought. It is a work that should be

in the hands of every biologist or research worker in any of the biologic sciences. It should serve as a vast storehouse of reference material to be utilized in premedic courses of physics and mathematics. It would show the student the value of these two important branches of science in the field of medicine; a point of view which is so often overlooked. Such a volume as this should prove of inestimable value to the physical therapist whose whole field deals largely with physical principles.

WAR GASES: THEIR IDENTIFICATION AND DECONTAMINATION. By Morris B. Jacobs, Ph.D., Food, Drug and Insecticide Admin., U. S. Dept. of Agriculture, 1927; Chemist, Department of Health, City of New York, 1928; formerly Lt. U. S. Chemical Warfare Service Reserve. Cloth. Price, \$3.00. Pp. 180. New York: Interscience Publishers, Inc., 1942.

Poison gas is a formidable weapon but there is no mystery in its use and little in its action. It has been said by some that since war gases have not been used to any great extent in World War II, they will not be used. Others claim that it has been proved that the damage resulting from gas attacks by air are not commensurate with the effort, therefore war gases will not be used. Many think that such complacency is dangerous and is to be deplored. The most plausible reason that war gases have not been used is that European peoples have been prepared for years against such attacks, so that small damage would result. It is unwarranted to believe that war gases would not take a heavy toll of a populace, which is unprotected and uneducated insofar as war gases are concerned. Such attacks, launched against an unprepared people, might be extremely serious. Our enemies are resourceful and unscrupulous. This book presents the identification of war gases and describes the decontamination of roads, buildings, clothing, water and food. The book is highly recommended to those interested in chemical warfare either in the armed forces or in civilian defense.

TREATMENT IN GENERAL MEDICINE. Edited by Hobart A. Reimann, M.D., Magee Professor of Practice of Medicine and Clinical Medicine, Jefferson Medical College, Philadelphia. 1943 Progressive Volume. Cloth. Pp. 247. Philadelphia: F. A. Davis Company, 1943.

This progress volume is designed to supplement the information presented in the second edition of the three volumes of Reimann's "Treatment in General Medicine." There are nineteen contributing editors. It presents the improvement and changes of thought in certain fields of therapy, notably in the treatment of infectious diseases, in obstetrical practice and in endocrinology. Because of the possibilities of bombing or other involvement of the civilian population of this Country in the war, considerable material is added covering the emergency treatment of injuries sustained in air raids, gas attacks, or other catastrophes with which the general practitioner may have to deal. There is a chapter on the progress of physical therapy by Dr. John S. Coulter.

This gives the Kenny method of treating poliomyelitis; the use of indirect heat to increase blood flow to the extremities; amputation during refrigeration; treatment of injuries of peripheral nerves; posture and nursing; treatment of soldier's foot and disinfection of air by ultraviolet radiation. This volume should be in the library of everyone who has Reimann's "Treatment in General Medicine."

A DOCTOR WITHOUT A COUNTRY. By *Thomas A. Lambie, M.D., Sc.D., F.R.G.S.*, formerly Director of the George Memorial Hospital, Ethiopia; Former Executive Secretary of the Ethiopian Red Cross, and Physician to H. I. H. Haile Selassie. Field Director of Sudan Interior Mission. With an Introduction by *Howard A. Kelly, M.D., F.A.C.S., LL.D.*, of Johns Hopkins University. Second Edition. Cloth. Pp. 252. Price, \$2.00. Illustrated. New York and London: Fleming H. Revell Company, 1939.

As a medical missionary Dr. Lambie relates his experiences in the remote regions of northeast Africa. While one is extremely interested in his accounts of his medical service one is equally if not more interested in his story of the difficult travel and daring adventure met by the author and his family. No less an authority than the late great Howard Kelly writes the introduction in a way to give one a true picture of the writer and his work and he has said of the work that it is "a thrilling, instructive narrative, broad enough also to command the genuine interest of all. The expert work of our doctor writer should, too, engage the attention of our profession. It has appeared to me that I was following in the footsteps of our great David Livingstone; in like fashion, Lambie traversed the Anglo-Sudan." It is said that he is the only American who ever became a citizen of Ethiopia and his service in Abyssinia made it possible for him to become personally acquainted with Haile Selassie and other notables of the Abyssinian government. Because he saw much of the work in Ethiopia wrecked by the Italian invasion we believe his account is even of historical importance. The entire narrative is based certainly on a profound religious feeling which is refreshing. The book is recommended as highly entertaining as well as educational.

ESSENTIALS OF NUTRITION. By *Henry C. Sherman* and *Caroline Sherman Langford*, Columbia University. Second Edition. Cloth. Pp. 442, illustrated. Price, \$3.50. New York: The Macmillan Company, 1943.

Anyone who has an interest in the field of nutrition will at once recognize the name of Sherman and will be anxious to see what these authors have to present especially since there are so many new and important advances in nutrition. Because

of the great role food is playing in our war effort both at home and in the armed forces much of the material in this popularly written edition has been grouped to be coupled with this need. The authors in their preface to the second edition state that "many of the chapters have been largely rewritten to incorporate qualitatively new discoveries and to revise quantitative estimates of needs and 'dietary standards' in accordance with the *Recommended Daily Allowances for Specific Nutrients* published by the National Research Council and often called 'the new yardstick of good nutrition'." No doubt the book is intended for the young student of nutrition because as pointed out by the authors the text assumes no prerequisite training in science. The present approach to the facts and principles of the science of nutrition is mainly through the relations of food to health and efficiency. The main subject matter covers (1) the energy aspects of nutrition, (2) the proteins and their amino acids, (3) the mineral elements, and (4) the vitamins. There are numerous data tabulated in the Appendix. These tabulations represent the results of a very extended and painstaking study of all the evidence available to the authors. Today the science of nutrition is hardly the property of the nutritionist or other scientist because all groups are more nutrition conscious than ever before. The text is recommended for the student and is an excellent addition to add or select perhaps from the long list of books on the subject.

ADVANCES IN INTERNAL MEDICINE. VOLUME I. *J. Murray Steele, M.D.*, Editor, Welfare Hospital, New York University Division, Welfare Island, N. Y. and a group of seven well known associate editors. Cloth. Price, \$4.50. Pp. 292. Twenty figures and illustrations. New York: Interscience Publishers, Inc., 1942.

The present volume is the first in a series of informal résumés of recent progress in the field of internal medicine. Succeeding volumes are to be published from time to time as the need becomes apparent. This one is made up of ten authoritative articles on subjects of current interest in this field. Each essay has been prepared by a man especially well qualified for the discussion of the subject assigned. The choice of topics is good and the treatment excellent. Contained in the volume are the following essays: on the Miller-Abbott tube by Abbott; on regular and protamine insulin by Lavietes; on the sympathetic nervous control of the peripheral vascular system by Wilkins; two on the sulfonamides, one by McLeod and one by Keefer; on urinary infections by Rantze; on the epidemiology of influenza by Francis; on hypertension by Page and Corcoran; and on riboflavin deficiency by Jeghers. The wide scope of the material covered renders this volume important not only to the internist, but to physicians and surgeons in all the medical and surgical specialties.

PHYSICAL THERAPY ABSTRACTS

Follow-Up Study of Physical Therapy Applied at Home for Arthritis. J. V. Treusch, and F. H. Krusen.

Proc. Staff Meet., Mayo Clin. 17:524 (Oct. 7) 1942.

Physical therapy has come to play one of the central roles in the general therapeutic program outlined for the patient who has chronic arthritis. Home treatment with physical measures finds its place either as a less elaborate continuation of the beneficial measures started in the Section on Physical Therapy or as a primary home regimen of simple physical measures supplemented, whenever possible, by professional treatments once or twice weekly. For several years now a plan has been in effect at the clinic whereby every arthritic patient seen by a physician in the Section on Physical Therapy is prescribed for individually and is given a minimum of one instruction treatment by a trained technician. In addition, he is given on dismissal detailed and exact written instructions concerning methods to be used at home. In other words, physical therapy is prescribed for application at home as individually and specifically as any other medical or therapeutic procedure.

In the group of cases of rheumatoid arthritis thirty-two (56.1 per cent) of the fifty-seven patients who had only one instruction treatment, received benefit according to this criterion. Of the fourteen patients who were given two or more instructions as outpatients, twelve (85.7 per cent) received benefit according to this criterion, and of the twenty-five patients who were given the intensive hospital regimen, seventeen (68.0 per cent) received benefit. This 68 per cent is less than 85.7 per cent, but it must be remembered that these patients were definitely more severely ill. In spite of the fact that they were more severely ill, they still did considerably better (compare 68.0 per cent to 56.1 per cent) than those less severely ill patients who took only one instruction treatment. When the total of the patients with rheumatoid arthritis who had two or more instruction treatments is considered we see that the 74.4 per cent of this group who received benefit is significantly greater than the 56.1 per cent receiving benefit of the group who had only one instruction treatment.

Likewise, according to this criterion, in the case of osteo-arthritis forty-three (62.3 per cent) of sixty-nine patients who arranged for only one instruction treatment were benefited and nine (69.2 per cent of thirteen patients who had two or more instruction treatments were benefited. This seemed to indicate that it is not quite as important, though still of some possible value, to encourage the patients with osteo-arthritis to take

an extra instruction treatment or two. The practical conclusion here is that it is certainly worth while for the patients, especially for those who have rheumatoid arthritis, to take more than just one instruction treatment and we are justified therefore in encouraging the patients to do so.

Galvanic Stimulation of Muscle Following Peripheral Nerve Section.

J. A. M. A. 120:375 (Oct. 3) 1942.

About one hundred years ago a controversy, typical of many that arose in the early nineteenth century, disturbed physiologists and anatomists. They debated actively the question of the relationship between nervous tissue, particularly the spinal and peripheral nerves, and the contractile elements of muscle. Was the property of muscular contractility inherent in the muscle itself or was it derived from the nervous system? Haller, then the greatest voice in physiology, maintained after numerous experiments that contractility remained after the nerves to a muscle had been cut through. The property of contractility, according to the hallerians, was independent of the nervous system and inherent in the muscular fiber itself. Such a bold assertion could not pass in that period without animadversion. Other learned physiologists, an influential sect called the "neurologists," maintained that contractility was a property of the nervous system itself. Although the neurologists modified their dogmatic tenets from time to time and the hallerians extended the term "contractility," neither side overwhelmed the other for many years. Frequent experiments won for the neurologists a position of some security. Muscles lose their power of contractility when deprived of nervous influence after ten days or more.

As was characteristic of the period, much paper and ink were expended in theoretical argumentation. A few observers made wise use of the experimental method. John Reid, a young lecturer on physiology in the University of Edinburgh, while at work attempting to unravel the hallerian-neurologist entanglement, made another discovery of prime importance to medicine and of far reaching significance in civil as well as military neurology. In the third of a series of experiments, Reid reported his results as follows:

The spinal nerves were cut across, as they lie in the lower part of the spinal canal, in four frogs, and both posterior extremities were thus insulated from their nervous connections with the spinal cord. The muscles of one of the paralyzed limbs were daily exercised by a weak galvanic battery, while the muscles of the other limb were allowed to remain quiescent. This was continued for two months, and at the end of that time the muscles of the exercised limb retained their original size and firmness and contracted vigorously, while those of the quiescent limb had shrunk to at least one half of their former bulk and presented a marked contrast with those of the exercised limb. The muscles of the quiescent limb still retained their contractility, even at the end of two months; but there can be little doubt that,

from the imperfect nutrition of the muscles and the progressing changes in their physical structure, this would in no time have disappeared had circumstances permitted me to prolong the experiment.

Reid noted the importance of galvanic stimulation in maintaining the nutrition of a muscle deprived of its nervous influence. Subsequently other investigators learned that galvanism is the only means at our command of stimulating muscular contraction in a completely paralyzed muscle. As early as 1841 Reid saw the clinical implication of his animal experiment, for in a footnote he wrote "The application of the results of these experiments to the treatment of certain cases of paralysis is so obvious as to require no illustration."

Although the value of galvanism to Reid may have been "obvious," its use was by no means universally adopted by the medical profession. Over the hundred years since his discovery its value has been both overrated and completely repudiated. Experiments in the last war did not completely settle the problem, but the recent work of Ernest Gutmann and Ludwig Guttmann put a stamp of approval on the importance of inducing muscular contractions by galvanic stimulation in accelerating the return of muscle to its initial volume after reinnervation and possibly in preventing atrophy. These experiments found, moreover, that muscles treated with galvanism showed less fibrosis and a better excitability and contractility on direct stimulation as well as a stronger reflex action than those untreated. Reid's position is thus completely upheld by Gutmann and Guttmann, and his crucial experiment, nearly lost in the dusty literature of the past, takes a new and important place in the history of medicine.

Rehabilitation After Head Injuries. Hugh Cairns.

Brit. J. Phys. Med. & Indus. Hygiene 5:84 (May-June) 1942.

There is no certain way of preventing post-traumatic headaches, but what we can do is to condition the patient to them by graded physical activity, combined with explanation and the use of analgesic drugs when required. It is a better policy to begin to get the patient out of bed about a week after he has recovered full consciousness, and then, without curtailing the time spent in hospital, to subject him to a graduated regimen of physical hardening. This can be done without increasing the frequency of post-traumatic headaches. Before the patient goes on a train journey he should have had a course of physical exercises and should have been tested by visits to the shops or cinema and by other normal activities. If any of these is followed by headache he can be given temporary rest, analgesic drugs and explanation that although a certain amount of headache is inevitable after head injury it does not signify permanent brain damage.

Very little headway can be made by the routine application of physical exercises and occupational therapy without thorough assessment both of the degree of brain damage and of the type of pa-

tient. After investigation has been made the next step is to reassure the patient, as one can reasonably do in the great majority of cases, that there is little likelihood of residual disability. After the patient has returned to consciousness, the process of getting up should not be long delayed and should soon be followed by graduated physical activities. Occupational therapy may be necessary, especially for patients in the services, who must be rendered fit for full duty before they can be returned to their units. In patients in whom the degree of permanent disability from hemiparesis and other signs is likely to interfere with the resumption of former occupations, vocational training is required. Every effort should be made to encourage the patient to adjust himself to the effects of his injury, and this usually involves an intimate study on common sense lines of the man, his background, his mood and his anxieties. The process of rehabilitation should be continued into the factory. In many cases, particularly in the later stages of convalescence and on resumption of work, headaches and attacks of dizziness may be troublesome symptoms. While these probably have an organic basis they are usually not insupportable, and they respond quickly to symptomatic treatment if the patient is assisted to make a satisfactory adjustment on the psychological side.

Causes of breakdown have been illustrated in the foregoing case reports. Returning to work too early is one of the common ones. In the early stages of convalescence the patient may lack insight or may be pathologically restless. Physical softness on return to the outside world is another cause of breakdown, particularly in the services. Unsuitable occupation is another cause which may interfere with satisfactory return to full work, particularly in the services.

The Role of the Viscera in Regulating the Temperature of the Body of an Animal Under Physiological and Pathological Conditions. N. A. Federov and E. I. Shur.

Am. J. Physiol. 137:30 (Aug. 1) 1942.

Thermogenesis in the viscera (liver and intestines) was studied in normal, artificially cooled and heated animals, as well as during febrile states caused by homogeneous and heterogeneous blood transfusions. The experiments were made on angiotomized dogs with cannulas in the portal and hepatic veins; in each animal the rectal temperature and the temperature of the blood in the abdominal aorta and the portal and hepatic veins were measured. The thermoelectric method used throughout the experiments detected changes in temperature with sufficient accuracy and made it possible to study thermotopography in the organism. In normal fasting dogs the lowest temperature of the blood was found in the aorta and the highest in the hepatic vein. The experiments have shown important thermogenesis in the intestines. When the animals were cooled by the application of ice to the skin, the difference in temperature between the blood in the hepatic and the portal veins increased, i.e., there was a rise

in hepatic heat production (three to six times the original level), providing the blood flow was accelerated; when the animal was overheated, the reverse took place. Homogeneous blood transfusion did not bring about noticeable systemic rise in temperature. The febrile state caused by heterogeneous transfusion is accompanied by a noticeable increase in the thermogenesis in the liver and the intestines. A comparative study of the hemodynamic variations has shown that the increase in hepatic and intestinal thermogenesis cannot be explained by the influence of circulatory factors. After anaphylactic shock, the same changes were observed as in the case of heterogeneous transfusion, but the variations in temperature were much greater, especially with respect to the intestines. The increase in visceral thermogenesis proceeds parallel to the systemic temperature reaction, i.e., the liver and the intestines participate in determining the febrile process accompanying the transfusion of foreign blood. The use of the method of E. I. Lodon for studying visceral thermogenesis in angiotomized dogs considerably widens the sphere of its application and promises to give results of great practical and theoretical interest.

Quantitative Studies of the Photochemical Depreciation of Horse Serum. An Approach to the Problem of Intravenous Foreign Protein Therapy. J. P. Henry.

J. Exper. Med. 76:451 (Nov. 1) 1942.

Normal horse serum was irradiated for periods of three to four days, with visible light or with ultraviolet light of known intensity and wavelength. The photosensitizer hematoporphyrin was employed in some instances. The serum was exposed to the air in thin layers and thoroughly agitated throughout irradiation. The irradiated sera were unchanged in color, and over 90 per cent of the original protein content remained precipitable by phosphotungstic acid. Studies of the antigenicity of the sera were carried out on guinea pigs and rabbits. Fresh antigenicities of deviated specificity and of an activity of the order of 1/50th, 1/1,000th, and less than 1/20,000th that of normal horse serum were obtained. The residual content of material having the same antigenic specificity as normal horse serum was estimated as approximately equivalent in activity to dilutions of normal horse serum of 1 cc., 1/10 cc., and less than 1/100 cc. per litre respectively.

The Electrofit in the Treatment of Mental Disease. David J. Impastato, and Renato Almansì.

J. Nerv. & Ment. Dis. 96:395 (Oct.) 1942.

Electrotherapy for the treatment of mental disease was introduced by Cerletti and Bini in 1938. They called their method "Electroshock Therapy." Others have named the method "Electric-Convulsion Therapy," or "Electrically Induced Convulsions." All these terms have obvious dis-

advantages, and to overcome these, we have chosen the name of "Electrofit Therapy."

The electrofit therapy as far as is known is a relatively safe form of shock therapy. It has distinct advantages over metrazol and insulin shock therapy. The results obtained are about the same as those obtained by metrazol therapy. In the affective psychoses most authors report 80 per cent of remission. Under favorable circumstances the treatment can be administered at the office or in an outpatient department. The apparatus, technic, course of the treatment, indications, manifestations, advantages and complications are discussed.

Posture Habits in Infancy Affecting Foot and Leg Alignments. H. E. Thelander, and Mabel L. Fitzhugh.

J. Pediat. 21:306 (Sept.) 1942.

The material in the study was obtained largely from the Children's Health Center of the American Association of University Women (A. A. U. W.). Over 1,000 children are registered at the center.

Deviations from the ideal midposition of children's feet may be partly due to prenatal causes and partly acquired by faulty sleeping positions.

Some of these malalignments are actual and persist and others may disappear during normal growth under favorable conditions of symmetrical activity. It is important that deviations from the neutral position be recognized and corrected before weight-bearing begins. Distorted sleeping and sitting positions during infancy and childhood are found to cause permanent distortions of feet, ankles and knees. It is not safe to assume that all early faults in alignment will automatically disappear during the period of growth. The earlier a distortion and its contributing factors are recognized and measures taken to overcome them the more certain are the results.

Physically Handicapped Persons and Employment. Donald C. Norris.

Brit. J. Phys. Med. & Indus. Hygiene 5:130 (Sept.-Oct.) 1942.

The physically handicapped form a large and heterogeneous group, which has in the mass a considerable capacity for contributing to the national war effort and if allowed to do so may thereby achieve self-respect and the satisfaction and happiness which come from economic independence and the realization that one is no longer alone or unwanted. But if these results are to be obtained, it is essential that the medical officer who advises about such employment should be familiar with the physiologic and anatomic requirements of industry and with the potentialities and limitations attaching to the training and placing of disabled workers.

During the latter part of the war of 1914-18 the Government set up training centers for disabled ex-service men but as the numbers of those seeking training declined, the scheme was allowed

to lapse. Similar plans have now been drafted by the Ministry of Labor and National Service which issued an Interim Scheme for the Training and Resettlement of Disabled Persons (1942). The Ministry officials interview injured patients in hospitals and advise them about steps to be taken to assist them to get back to work; some 20,000 interviews were conducted in the first six months of the operation of this scheme, and about 6 per cent of the persons concerned were found to require re-training after medical treatment was completed. In most cases the injured worker was able to resume his pre-accident occupation after a short period of instruction in one of the Ministry's Training Centers, but so far the Ministry has not set up any special center for the more seriously disabled.

There is no doubt that discrimination is practiced against the engagement of physically handicapped workers, but such discrimination is usually based on misapprehension, ignorance or prejudice.

Surgical Amputations and the Fitting of Artificial Limbs. A. W. J. Craft.

Brit. M. J. 4265-389 (Oct. 3) 1942.

Care and treatment of the amputated limb are almost as important as the amputation itself and should begin from the day of operation. The stump does not require a pillow or pad to rest on, but ought to lie extended, while in the case of a below-knee amputation a back splint is often necessary to prevent flexion of the knee-joint. After the stitches have been taken out and the wound is healing, active exercises should be started while the stump is still bandaged. Movements of the joints must be encouraged, to tone up the muscles and assist in tissue reduction in the stump. Massage has been shown to be inadvisable. Furthermore, it does not reduce the oedema, but rather irritates the nerves and should therefore not be given at any stage during recovery.

The modern method devised by the Ministry of Pensions and adopted by the E. M. S. is to bandage the stump with crepe bandages from the time the stitches are taken out. It has been proved from records compiled at Roehampton that an above-knee stump requires only three weeks' bandaging to render it fit for measurements to be taken for an artificial limb.

A recent development in the care of stumps after amputation is a course of exercises adopted to re-educate the remaining muscles of the stump and thus prepare it to control the artificial limb. A narrow sleeve, about 4 in. wide at the back and 2 in. at the front, from which a cord passes over a pulley and suspends a weight of 7 to 14 lbs., is placed on the stump. The stump is extended against the pull of the suspended weight to assist the musculature in regaining its strength—the weights, rate of exercise, and duration varying with the increase in muscle tone. The adductors are similarly exercised by the patient's standing with his side toward the pulley, the stump being drawn towards the midline of the body. If the

patient is at home the exercise can be carried out by allowing the cord to pass over the back of a chair upon which somebody is sitting to steady it.

An arm amputee usually has a more despondent outlook than a leg case. It is for this reason that such cases should be fitted with prostheses as quickly as possible, otherwise there is a tendency to rely too much on the remaining hand. An arm can in the average case be fitted and used within a month of the operation.

Rehabilitation in Ophthalmic Cases. Lady Duke-Elder, and R. C. Davenport.

Brit. J. Phys. Med. & Indus. Hygiene 5:88 (May-June) 1942.

From the practical point of view rehabilitation in recoverable eye cases can be most usefully described under two heads: first, the functional rehabilitation of those who have suddenly been visually disoriented, e. g., by the loss of one eye or by the development of acute muscular imbalance; secondly, the physical rehabilitation of those who are convalescing from an ocular disease or injury.

In the first category, measures to accommodate the patient to the loss of an eye are relatively simple. The principles to be observed are rapid restoration of physical fitness, training to compensate for the loss of binocular vision and to readjust the faculty of orientation, and measures to overcome the psychological distress of mutilation. These ends are attained by physical training exercises in which, in addition to toning up the system generally, special attention is paid to reeducating the sense of equilibrium and the judgment of distances by means of parallel bars, jumping and balancing exercises; this is implemented by organized games out-of-doors, particularly ball games, which are rapidly stepped up in speed and organized indoor games such as ping-pong and billiards. The more sedentary part of the day is spent in occupational therapy; this can be of great value, the best results being obtained by weaving on a big loom and the performance of other tasks involving rapid and fine coordination between eye and hand. Finally, in the development of what might be called "uniocular confidence," the psychologic aspect is by no means of least importance. Handling by the medical and nursing staffs should be encouraging but very matter-of-fact; emphasis should be laid on the wide scope in both military and civil life for the one-eyed person, as exemplified in an Admiral Nelson or a General Wavell; while association with others who are in a like condition but have now realized the smallness of the disability from both the practical and cosmetic point of view, is of the first importance. Partly with the intention of producing comfort and hygiene of the socket and partly to stimulate self-confidence the utmost care should be taken that the first artificial eye is well-fitting and good-looking; the patient should not be returned to duty until this is ensured.

Resuscitation in Advanced Asphyxia: Role of Positive and Negative Pressure. S. A. Thompson, and G. L. Birnbaum, With Technical Collaboration of E. Ostrow.

Surgery 12:284 (Aug.) 1942.

Advanced asphyxia (cessation of respiration) in dogs was produced by Thompson and Birnbaum by mechanical obstruction of a face mask, obstruction of an intratracheal tube or inhalation of inert gases. The degree of success of the four resuscitation procedures carried out were manual artificial respiration with inhalation of oxygen in 55 per cent, rhythmic inflation with oxygen in 78 per cent, rhythmic suction with oxygen in 80 per cent and rhythmic inflation and suction in 95 per cent.

Sodium Sulfathiazole Iontophoresis. J. L. Boyd.

Arch. Ophth. 28:205 (Aug.) 1942.

According to Boyd, iontophoresis of a 5 per cent solution of sodium sulfathiazole with 1 milliamperes for two minutes when compared with a corneal bath of equal duration increases the corneal and aqueous humor concentration of sulfathiazole by three times. With a current of 2 milliamperes the concentration in the cornea and in the aqueous humor is increased ten and nine times, respectively. There was no ocular damage with the use of a current that produces a concentration of sulfathiazole consistent with an optimal bacteriostatic effect.

Pain and Tenderness During the Acute Stage of Poliomyelitis. Frank R. Ober.

J. A. M. A. 120:514 (Oct. 17) 1942.

The areas chiefly affected by spasm and tenderness are the muscles of the cervical, dorsal and lumbar regions, the adductors of the shoulder, and abdomen, the calf; the knee flexors and extensors; the hip flexors, extensors, adductors and the abductors.

One of the most important aspects of the very early stage is to be able to recognize spasm and deep muscle pain. Each patient must be examined with great care and extreme gentleness or he will be treated as if he were convalescing from any acute infection. Rough handling, early massage, bad bed nursing and neglect will increase the acute condition. There are certain tests recommended by which it is possible to learn whether or not spasm, stiffness, and pain are present.

Muscle spasm may be felt and seen. Muscle soreness can be elicited by steady, gentle pressure of the muscles and by a gentle stretching of the muscles.

It is important to know how to test for tenderness. In the average case slow, gentle squeezing or pressing the muscles may elicit pain. Stretching the calf muscles by gently, slowly and steadily dorsiflexing the foot when the leg is extended and slow, straight leg raising will result in pain in the hamstrings and buttock mus-

cles. Attempts to straighten out flexion deformities at the knee and hip will be attended with pain.

Shoulder: Hold the shoulder down from above with one hand and gently abduct. If there is sensitiveness in the adductors, pain and spasm will occur in these muscles.

Neck and Spine: Place the patient on his side and flex his neck and trunk. If there is pain and spasm in the spinal muscles, the attempt at flexion will be resisted.

Abdomen: To elicit tenderness, the physician should palpate the muscles with firm, steady pressure until pain is exhibited by the patient.

Tuberculous Tracheobronchitis. Francisco J. Menendez, and Pedro Hernandez Gonzalo.

Dis. of Chest 8:382 (Dec.) 1942.

Antispasmodic and sedative medication, chemotherapy with gold salts, tuberculin therapy, massive doses of Vitamin C, have only given, at best, slight and temporary relief. Neither has ultraviolet radiation given better results.

Roentgenotherapy has also been employed, the authorities disagreeing as to its therapeutic indications and results.

Electrocoagulation by means of Kernan's electrode gives good results if in the hands of an expert, as reported by Packard and Davison, but it is necessary to be careful in using it, employing only current of very low intensity and avoiding the slightest possibility of producing necrosis. The electrode is never applied in the same place for more than five seconds, which avoid coagulation larger than 1 mm. deep. Not all of the tuberculous tissue should be destroyed, but rather, the natural restorative process should be simulated, because otherwise one risks perforation of the bronchus or development of stenotic cicatrices.

Cauterization with solutions of silver nitrate, trichloroacetic acid, give good results, especially in the ulcerous types and in the granulomatous forms when they are extensive, and are as far as is known, much less dangerous than electrocoagulation.

The Kenny Treatment of Infantile Paralysis. George J. Garceau; Carl Martz, and Paul Reith.

J. Indiana M. A. 35:677 (Dec.) 1942.

The authors believe that the group of Kenny treated patients is, as a whole, much better than any group treated by them by other methods in previous years. With more experience for the professional group treating these patients it is reasonable to believe that even better results will be obtained. A large series of patients so treated will be necessary critically to evaluate the method. It appears that the patients so treated will, in many instances, still need braces and surgical assistance, but the condition of the patient will be much better for such aids than if they had been treated by the old method of rest, splints and other forms of physical therapy.

Infectious Eczematoid Dermatitis. David L. Cooper.

Pennsylvania M. J. 46:218 (Dec.) 1942.

Infectious eczematoid dermatitis is more easily described than defined. The primary lesion is usually an erythematous, scaling or crusted, weeping spot. From these lesions, patches are formed by peripheral extension of the initial points or by coalescence of many individual lesions. When fully developed, the patches are crusted, weeping, or scaling and they enlarge at the periphery by the formation of pustules or vesicles, or, more commonly, by the splitting up or undermining of the epidermis. There is never any attempt at central involution. The border may be sharply defined and irregular. Marked edema may be present. The subjective symptoms are usually milder than in eczema, although the disease is spread by scratching. The condition may be acute or chronic, and may involve any part of the body.

Infectious eczematoid dermatitis is caused by the *Staphylococcus aureus* or *albus*; it may be infectious or auto-infectious. It may be contracted by a person who has no focus of infection from one who has a pyogenic infection—discharging sinus from a wound, boil, abscess, discharging ear, nose, eye. Most often the condition results from auto-infection, because it frequently appears near the site of a discharging orifice—ear, nose, mouth, or eye. This is due to infection of the neighboring skin by the pyogenic organism causing the infection at the original site.

There is no specific in the treatment of infectious eczematoid dermatitis, although the introduction of the "sulfa" group of drugs marks a great advancement in its therapy. The following measures have been used with varying success:

1. Elimination of the focus of infection is of prime importance.
2. Moist compresses in the acute vesicular or exudative stage.
3. *Staphylococcus vaccine* has been found useful by some and worthless by others.
4. Ultraviolet irradiation in gradually increasing doses is of value in some cases.
5. Roentgenotherapy may be used in either the acute or chronic stage.
6. Sulfathiazole by mouth in doses of one gram every four hours.

Actinic Therapy in Middle Ear Infections. Frederick J. Chapman.

Soc. J. Iowa 32:20 (Jan.) 1942.

Scharmkoff and Schemedinck, Percy Hall, Russell, Eidenow and others maintain that ultraviolet increases the bactericidal properties of the blood. They have also shown conclusively that its application not only raises the blood calcium but stabilizes it as well and it is believed that phosphorous and other minerals are similarly affected.

How does all this apply to the purulent ear? This discussion has to do largely with children and young people, who are the most common victims of suppurative ears.

Luminous heat is the most readily available and the least expensive of all the electric energies. This form of treatment is particularly effective in the pain of the acute otalgias of children. Usually they will tolerate it much better than they will any other form of heat because of its pain-relieving, soothing qualities. Often a threatened otitis media will be aborted if the light is applied early.

To the ear which is already suppurating the effects are equally beneficial. There will usually be a temporary increase in the discharge but this will be followed by a noticeable lessening as the treatments are continued.

Ultraviolet Blood Irradiation Therapy (Knott Technic) in Acute Pyogenic Infections. G. Miley.

Am. J. Surg. 57:593 (Sept.) 1942.

During the last three years Miley has used ultraviolet to irradiate the blood of 151 consecutive unselected patients with acute pyogenic infection. The Knott technic, which withdraws, citrates, irradiates and returns it intravenously to the patient, was employed. Most of the 151 patients received no chemotherapy before or after irradiations; a few were admittedly chemotherapeutic failures. The results show that 100 per cent of the patients with early lesions, 98 per cent with moderately advanced lesions and 42 per cent who were apparently moribund recovered. All the invading bacterial organisms disappeared except those in cases of *Staphylococcus aureus* septicemia and acute or subacute bacterial endocarditis. The detoxification effect was most striking. Twelve to seventy-two hours following therapy nausea, vomiting, delirium, fever, general malaise, rapid pulse and rapid respiration subside. Abnormally high temperature falls by lysis or crisis. Grossly discernible peripheral vasodilatation occurred within five to ten minutes after the irradiated blood was returned to the venous circulation in more than 75 per cent of all patients. This persisted in some for more than thirty days. Ultraviolet irradiation of the blood can safely follow the administration of sulfonamide derivatives, quinine and iodides, but sulfanilamide, sulfapyridine and iodides cannot be given with the first five days after irradiation without risking a probable photosensitive reaction. The convalescence of patients given only blood irradiation is much shorter than of those who also receive sulfonamides. Such irradiation increases the uptake of oxygen. General resistance is obviously increased. As yet, in no instance of acute pyogenic infection uncomplicated by septicemia did the infection progress to septicemia after ultraviolet blood irradiation was employed.

Unidirectional Electrostimulated Convulsive Therapy. I. The Effect of Wave Form and Stimulus Characteristics on the Convulsive Dose. Emerick Friedman.

Am. J. Psychiat. 99:223 (Sept.) 1942.

1. Unidirectional electrostimulation was therapeutically applied in convulsive doses to 176 hospitalized psychiatric patients. The present report covers 2,746 convulsive reactions induced through left temple (negative), vertex-of-skull (positive) electrode placements.

2. The threshold convulsive dose, expressed in milliamperes-seconds (product of intensity and duration of stimulation), was determined for four different types of unidirectional electrostimulation. The technic for obtaining threshold convulsive doses was described.

3. Type A. 1. Stimulation consisting of rectified waves at 69/sec., each wave lasting 1/20 sec. with intervals of 1/120 sec. was tried in 154 instances. Practically 68 per cent of the trials gave convulsive thresholds at 50 milliamperes-sec. or less, with 45 per cent requiring intensity level of 46-60 milliamperes.

4. Type A. 2. Stimulation, designated as type A. 1. waves interrupted by a make commutator at 10/sec. giving rise to impulse bursts of 1/20 sec., was tried in 1,735 instances. In 83 per cent of the trials the convulsive dose was 50 milliamperes-sec. or less with 52 per cent in the 26 to 50 milliamperes-sec. group and 31 per cent requiring 1 to 25 milliamperes-sec. The intensity level was in the 16 to 30 milliamperes group in over 70 per cent of the trials.

5. Type C. 2. Stimulation is described as 10/sec. commutator interrupted type C. 1. wave form. Type C. 1. is a 60/sec., slightly smoothed (filtered) rectified wave form, each wave lasting 1/60 sec. with no interval. Of the 270 convulsive doses by type C. 2. stimulation, 66 per cent occurred at 50 milliamperes-sec. or less, with the intensity level in the 16 to 30 milliamperes group in 72 per cent of the trials.

6. Type C. 3. Stimulation, described as the type C. 2. form further interrupted by rapid manipulation of the hand switch, was given 587 trials. Of these, practically all occurred at doses of 50 milliamperes-sec. or less, with 80 per cent at 1 to 25 milliamperes-sec. This markedly low convulsive dose more than offset the higher intensities required (49 to 90 milliamperes in 82 per cent of the trials).

7. Unidirectional electrostimulation seemed to offer convulsive doses markedly less than required by technics utilizing the alternating current.

not a magical formula of treatment, but actually an addition to the knowledge of the clinical manifestations of acute poliomyelitis which better enabled workers to care for its after effects. Spasm did exist and had to be attended to if the workers hoped to avoid contractures. A certain "mental alienation" did exist which must be overcome before efficient voluntary control was possible. These additions to knowledge did not contradict proven pathologic changes. If sufficient numbers of motor nerve cells supplying a bodily segment were destroyed, that bodily segment became flaccid and no known method of treatment could ever revive these dead cells. However, it was felt that in the majority of cases this massive destruction of anterior horn cells had not taken place, that there remained numbers of motor nerves still anatomically intact, but unused because of a physiologic blockage or distortion of the impulses to those nerves as a result of the central nervous system's reaction to virus invasion. A number of the anterior horn cells had been injured perhaps by edema, ischemia, or local tissue anoxia. These cells would later recover and be capable of normal response if sufficient impulses could be directed to them and the muscles thus innervated had been kept in a receptive state. It is felt that this distortion, or blockage of impulse in the spinal cord, upset the delicate balance of muscle power necessary for skilled movement and new coordination patterns must be built up by intelligent muscle re-education, tediously and meticulously carried out over long periods of time. Before muscle re-education can be efficient, the patient must be free of pain, the muscle hyperirritability and persistent shortening must be overcome and the joints must have a functional range of motion.

Recent developments have given no cure for poliomyelitis, but early treatment following the principles laid down by Miss Kenny, meticulously and carefully done will give the patient the greatest amount of functional rehabilitation possible through utilization of his undamaged nerve cells. Even if this treatment offered no statistical advantage over traditional forms it would still be the method of choice because the patient is far more comfortable during treatment, the skin and subcutaneous tissue are kept in excellent tone, circulation is improved, joints are kept mobile and the structural deviations and torsions caused by contractures of muscle are completely avoided. However, it is the feeling of many that we are only scratching the surface of treatment. Research men, physiologists and pathologists, must, and eventually will, give us the basis for these newer clinical manifestations. When all these basic factors are thoroughly understood, intelligent treatment will follow as a natural sequence. Scientific medicine should always take this orderly course. No one working alone can expect to develop the flawless treatment. Workers must profit from the observation of trusted investigators and evaluate these observations in the light of their own experiences.

Recent Developments in the Treatment of Poliomyelitis. Robert L. Bennett.

Southern M. J. 36:153 (Feb.) 1943.

The author states that those who have had the privilege of working with acute poliomyelitis began to appreciate that Miss Kenny's contribution was

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Hotel Statler, Buffalo, N. Y.

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JOSEPH A. E. SYRACUSE, M.D., Buffalo, N. Y.

2. Fever and Sulfadiazine Therapy in Refractory Gonorrhea.

FIRST LIEUT. SIDNEY LIGHT (MC), U. S. Army, Lovell General Hospital, Fort Devens, Mass.

Discussion: Stafford L. Warren, M.D., Rochester, N. Y.; Madge C. L. McGuinness, M.D., New York, N. Y.; George Slotkin, M.D., Buffalo, N. Y.

3. Problems in Early Physical Treatment of Poliomyelitis.

JESSIE WRIGHT, M.D., Director, D. T. Watson School of Physiotherapy, Leetsdale; Pittsburgh, Pa.

Discussion: Kristian G. Hansson, M.D., New York, N. Y.; Francis J. Gustina, M.D., Buffalo, N. Y.

4. Physical Therapy in Peripheral Nerve Injuries.

RICHARD KOVACS, M.D., Professor of Physical Therapy, New York Polyclinic Medical School and Hospital, New York, N. Y.

Discussion: Wallace B. Hamby, M.D., Buffalo, N. Y.; Albert A. Gartner, M.D., Buffalo, N. Y.

Luncheon

(Time and place to be announced at end of session)

DEMONSTRATIONS AND INSPECTIONS —

Physical Therapy Departments
2-5 p.m.

Millard Fillmore Hospital, 875 Lafayette Avenue, Tamara von Friesen, M.D., Director.

Cripple Children's Guild, 936 Delaware Avenue, Orpah Cable, R.N., R.P.T.T.

Ed. J. Meyer Memorial Hospital, 462 Grider Street, Sarkis J. Anthony, M.D., Acting Director.

Joseph A. E. Syracuse, M.D., *Chairman*,
Columbus Hospital, Buffalo, N. Y.

Kristian G. Hansson, M.D., *Secretary*,
33 East 61 Street, New York, N. Y.



This year of all years the appearance of the Easter seal for crippled children on our letterheads and the backs of envelopes carries a meaning which seems to go deeper than its obvious message.

The tenth annual sale of Easter seals for crippled children, sponsored by the National Society for Crippled Children and its affiliated organizations, will be conducted this year from March 26 to April 25.

THE CRIPPLED CHILD
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Course of PHYSICAL THERAPY



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American Congress of Physical Therapy

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